CMS Internal Note

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CMS Software and Computing Tasks and Deliverables

The CPT Project

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Abstract

This document describes the task breakdown and deliverables of the CMS CPT project, where:

"C" denotes "Computing and Core Software" (CCS);
"P" denotes "Physics Reconstruction and Selection" (PRS); and
"T" denotes "Trigger and Data Acquisition Systems (TriDAS) but, in the context of CPT, covers only the online software components of the TriDAS project.

Cross-project activities, notably the SPROM (Simulation PROject Management) and RPROM (Reconstruction PROject Management) groups are included.

It is intended to form *a starting point for discussions* that will ultimately lead to:

- a complete task breakdown structure for all CPT activities;
- descriptions of the main deliverables of each task;
- the definition of an organisational sub-structure for the CPT activities with L2 managers and clear reporting lines and channels of communication between the CCS, PRS, TriDAS and detector sub-projects;
- a schedule with well-defined milestones;
- a baseline estimate of the resources required to complete the project according to the required scope and on schedule.

Executive Summary

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Contents

Part I

Computing and Core Software (CCS)

1 Computing Centres *(Martti Pimiä)*

This task entails the provisioning of the actual computing resources for CMS. This is primarily a coordination and negotiation task where the actual resources for the Center flow through other channels (IT at CERN, the regional Center etc).

1.1 T0/T1 Centre at CERN

The Tier0/Tier1 at CERN is to support all raw data storage, the first reconstruction pass and adequate connectivity to the outside Tier1 and directly supported Tier2 centres. In addition, user support for the CERN-resident community has to be provided. It will provide about 1/3 of the total required computing resources in CMS.

Deliverable:	**1.1-a T0/T1 Liaison**
Description:	The negotiation with IT on the actual physical implementation and usage of the T0/T1 facilities. Includes the current Cocotime type of negotiation.
Responsible:	T0/T1 Coordinator
Client(s):	CMS
End Date:	Ongoing.
Risks/Constraints:	Common Facility for all four experiments. No direct authority.
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.2 available). T0/T1 Liaison.
Resource:	01/01/2003 - 31/12/2007: **0.4** FTE (0.0 available). T0/T1 Liaison.

Deliverable:	**1.1-b CMS T0/T1 Configuration**
Description:	To fit the CMS computing model, the resources of the T0/T1 will need proper configuration, optimisation, tuning. (CPUs, disk servers, mass storage, network topology, etc...) Current (3/2001) estimates including efficiency factors are that the T0/T1 in 2007 should supply to CMS: 688kSI95, 917TB of Disk, 1540TB of Active tape, 2632TB of Archive tape, 800 MB/s of tape I/O.
Responsible:	T0/T1 Coordinator
Client(s):	Production groups, Online DAQ.
End Date:	Ongoing
Risks/Constraints:	Common Facility for all four experiments. No direct authority.
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.0 available). T0/T1 Coord.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). T0/T1 Coord.
Resource:	01/01/2005 - 31/12/2007: **0.5** FTE (0.0 available). T0/T1 Coord.

Deliverable:	**1.1-c RC Distributed Computing**
Description:	Provide connectivity and services to Tier1 Regional Centres and attached Tier2s. Coordinate with outside centres.
Responsible:	RC Coordinator
Client(s):	All outside centres.
End Date:	Ongoing.
Risks/Constraints:	WAN bandwidth, No direct authority.
Resource:	01/01/2001 - 31/12/2007: **1.0** FTE (0.0 available). RC coordinator.

Deliverable:	**1.1-d T0 Online connectivity**
Description:	Specify the connectivity of CMS Online DAQ with Tier0.
Responsible:	T0 Online liaison
Client(s):	Online, CCS
End Date:	Fully functional in 2005. Prototypes before then.
Risks/Constraints:	Online system design.
Resource:	01/01/2002 - 31/12/2007: **0.1** FTE (0.0 available). Online Expert.
Resource:	01/01/2004 - 31/12/2007: **0.2** FTE (0.0 available). Online Expert.
Resource:	01/01/2006 - 31/12/2007: **0.2** FTE (0.0 available). Online Expert.

Deliverable:	**1.1-e User Administration at CERN-T1**
Description:	Administration of user accounts and resources, access rights etc
Responsible:	CERN user administration
Client(s):	CMS
End Date:	Ongoing.
Risks/Constraints:	All CMS users are allowed to access the Tier1 services at CERN
Resource:	01/01/2001 - 31/12/2007: **0.5** FTE (0.5 available). CERN User Adm.
Resource:	01/01/2002 - 31/12/2007: **0.5** FTE (0.5 available). CERN User Adm.

Deliverable:	**1.1-f T0/T1 monitoring and trouble-shooting**
Description:	CMS needs have to be specified, usage of facilities has to be monitored, problems have to be investigated.
Responsible:	CMS computing expert
Client(s):	Production groups, CCS, Online DAQ.
End Date:	Started already, fully functional in 2005.
Risks/Constraints:	
Resource:	01/01/2001 - 31/12/2007: **0.5** FTE (0.0 available). Comp. Expert.
Resource:	01/01/2002 - 31/12/2007: **0.5** FTE (0.0 available). Comp. Expert.

1.2 Tier 1 Regional Computing Centres

Each CMS Tier 1 Regional Center will provide deliverables to the experiment in several different categories. These include providing computing resources, staff to manage the computing, staff to provide software support, staff that will collaborate on development of CMS software products, and staff to share in the R&D and design of CMS computing systems. These contributions will be divided between deliverables to the experiment at large and meeting the needs of the local physics community. While the precise amount of the different contributions will vary from one regional centre to another, they will be present to some degree in each. We give figures here for a typical centre.

3/2001 we estimate that a canonical T1 facility should supply to CMS: 152kSI95, 276TB of Disk, 590TB of Active tape, 433TB of Archive tape, 400MB/s of Tape I/O.

Tier1 RC's are supposed to provide a full service, 24$\times$7, with an excellent connectivity to the T0/T1 at CERN and its attached Tier2s. It is optimised for scheduled tasks.

Deliverable:	**1.2-a Computing resources**
Description:	The Tier1 centre will provide CPU cycles, online disk storage, mass storage, I/O bandwidth between the CPU and disk/mass storage, and network bandwidth between the centre and CERN and between the centre and supported Tier2 and local CMS institutes. Typical quantities of these resources are 150-200 K SI95 CPU cycles, 300 TB of disk, 1-2 PB of mass storage, and 1 Gb/sec network connections. A substantial portion of the computing resources are assigned to perform some portion of the standard CMS processing, including simulation, reconstruction, event selection, physics object creation, and physics group analysis, as well as storage for canonical data samples. These computing tasks are predictable in their demands, and they will be shared among all the CMS centres to ensure all tasks are covered somewhere. These jobs will act as background activities in the centre, but enough resources must be reserved for these tasks to ensure timely completion. A fraction of the computing resources and storage will be available for allocation to CMS wide physics groups working on the data samples stored at that particular centre. The centre must be able to provide accounts for all CMS physicists working on those data samples independent of geographic location. Finally, some remaining portion of the resources will be reserved for the needs of local physics communities served by this centre. This includes needs of associated Tier2 and local centres which depend on the Tier1 to provide data samples and computing cycles. The centres will also need to provide testing and development facilities for CMS physics software development. The assignment of tasks and allocation of resources between these three portions will be negotiated on a regular basis between the centre and the CMS CCS project.
Responsible:	The T1 Managers
Client(s):	The T1/CMS Coordinators
End Date:	From 2004
Risks/Constraints:	Sufficient staff must be in place at the centre to operate the facility and ensure resource usage is consistent with priorities set by the experiment. This includes staff for tasks including operations, system administration, network operation, database administration, security and storage management. Video conferencing and other remote cyber presence activities must be supported. Some of this infrastructure support may share resources with management of existing facilities.

Deliverable:	**1.2-b IN2P3 Tier1 Centre**
Description:	The big computing centre in France will be the IN2P3CC located in Lyon. It will be shared between the LHC experiments. First, prototype phase, then building up initial production system.
Responsible:	CMS IN2P3CC Manager
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	

Deliverable:	**1.2-c Main Computing Centre in Germany**
Description:	The big computing centre in Germany is under discussion. It may be shared between the LHC experiments.
Responsible:	CMS German T1 Manager
Client(s):	RC coordinator
End Date:	From 2004.
Risks/Constraints:	

Deliverable:	**1.2-d INFN Tier1 Centre**
Description:	The big computing centre in Italy will be hosted by INFN. First, prototype phase, then building up initial production system.
Responsible:	CMS INFN Tier1 Manager
Client(s):	RC coordinator
End Date:	From 2001.
Risks/Constraints:	

Deliverable:	**1.2-e RDMS Computing Cluster**
Description:	The RDMS will form a cluster of computing centres with excellent connectivity between themselves, giving local data access services and a gateway connection to CERN.
Responsible:	CMS RDMS Cluster Manager
Client(s):	RC coordinator
End Date:	From 2001.
Risks/Constraints:	

Deliverable:	**1.2-f RAL T1 Centre**
Description:	The big computing centre in UK will be hosted by RAL and will be shared between the LHC experiments.
Responsible:	CMS RAL T1 Manager
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	

Deliverable:	**1.2-g FNAL T1 Centre**
Description:	The big US computing centre dedicated for CMS will be located in Fermilab. First, prototype phase, then building up initial production system.
Responsible:	CMS FNAL T1 Manager
Client(s):	RC coordinator
End Date:	From 2001.
Risks/Constraints:	

Deliverable:	**1.2-h Software Support**
Description:	The centre must provide personnel to aid in the installation and distribution of CMS software products, both at the centre itself and in associated Tier2 and local centres. Consulting support and help desk facilities should be provided. CMS distributed information resources must be provided and supported. Training in the use of CMS software should be provided.
Responsible:	The T1 Managers
Client(s):	The Regional physicists
End Date:	Ongoing.
Risks/Constraints:	Typically 5 FTE's at each centre will participate in these activities.

Deliverable:	**1.2-i Database Administration**
Description:	Each Tier1 centre will need a dedicated CMS database administrator.
Responsible:	The T1 Managers
Client(s):	The CCS Project
End Date:	From 2002
Risks/Constraints:	

Deliverable:	**1.2-j Production Coordination**
Description:	Each Tier1 centre will need a dedicated CMS production coordinator.
Responsible:	The T1 Managers
Client(s):	The CCS Project
End Date:	From 2001
Risks/Constraints:	

Deliverable:	**1.2-k GRID integration**
Description:	Each centre must integrate its computing system to use the CMS-agreed GRID methods and tools.
Responsible:	The T1 Managers
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	

Deliverable:	**1.2-l Computing System Research and Development**
Description:	Staff will also participate in the design of new CMS computing systems and evaluation of new technology, and collaborate on advanced computing R&D needed for future CMS computing systems. The needs of the regional centres must be included in architectural decisions, and the centres need to participate in developing solutions to the unprecedented computing challenges presented by the volume and complexity of the CMS data samples.
Responsible:	The T1 Managers
Client(s):	R&D for the CCS group
End Date:	Ongoing
Risks/Constraints:	Typically xxx FTE's at each centre will participate in these activities.

1.3 Tier 2 Regional Computing Centres

Typically, these are Institute or local community servers, providing attended services only during working hours (local time), and run unattended otherwise. The Tier2 centre will provide CPU cycles, online disk storage, and network bandwidth between the centre, its Tier1 and local CMS institutes.

Tier2s are optimised for analysis or chaotic access, running Monte-Carlo work in spare time.

In 3/2001 we estimate that in 2007 a canonical T2 will supply to CMS: 36 kSI95, 100 TB of Disk, 50 TB of Archive Tape and 100 MB/s of Tape I/O.

The general assumption is that a T2 is CMS specific.

Deliverable:	**1.3-a Computing resources**
Description:	The Computing resources available to CMS at the T2.
Responsible:	T2 Managers
Client(s):	The T2/CMS Coordinators
End Date:	From 2004
Risks/Constraints:	

1.4 Wide Area Networks

CMS will make extreme requirements on WAN's. The negotiation of WAN capacity is typically bigger than CMS, or CERN or even HEP. Nevertheless we must ensure that the computing facilities of CMS ore efficiently placed and used.

Deliverable:	**1.4-a WAN resources placeholder**
Description:	xxx
Responsible:	CMS WAN coordinator
Client(s):	xxx
End Date:	xxx
Risks/Constraints:	
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). WAN Coordinator.
Resource:	01/01/2003 - 31/12/2007: **0.2** FTE (0.0 available). WAN Coordinator.

1.5 Coordination of Technology Tracking

Each computing centre is evaluating new technology to be used in their centre. To avoid duplication of this work, some coordination effort is needed.

Deliverable:	**1.5-a Projection of cost and technology of CPU power**
Description:	Follow the field, make predictions.
Responsible:	TT coordinator
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	Some risks here...
Resource:	01/01/2002 - 31/12/2007: **0.05** FTE(0.0 available). Comp. Expert-TT.

Deliverable:	**1.5-b Projection of cost and technology of disk**
Description:	Follow the field, make predictions.
Responsible:	TT coordinator
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	Some risks here...
Resource:	01/01/2002 - 31/12/2007: **0.05** FTE(0.0 available). Comp. Expert-TT.

Deliverable:	**1.5-c Projection of cost and technology of mass storage**
Description:	Follow-up of technology and costing of mass storage based on robotic tape systems, both for active use of the stored data and for archived data.
Responsible:	TT coordinator
Client(s):	RC coordinator
End Date:	From 2002.
Risks/Constraints:	Follow the field, make predictions.
Resource:	01/01/2002 - 31/12/2007: **0.05** FTE(0.0 available). Comp. Expert-TT.

Deliverable:	**1.5-d Technology and cost projection of wide-area networks**
Description:	Follow-up of technology and policy of wide-area network services.
Responsible:	WAN engineer
Client(s):	The T1 and T2 managers
End Date:	From 2002.
Risks/Constraints:	Policy not in our control.
Resource:	01/01/2002 - 31/12/2007: **0.05** FTE(0.0 available). WAN engineer-TT.

1.6 Distributed System Simulations

Simulations of large scale computing systems are performed to help understand bottlenecks and optimise performance for a variety of configurations and running conditions: production, analysis, on-line, etc. After an initial verification phase where the simulation should be performed and compared against measured results from prototype computing centres, the simulation should be capable of accurately predicting the behaviour of the computing centre. The should allow problems to be diagnosed and solutions tested in the simulation. The MONARC simulation toolkit is currently employed.

Deliverable:	**1.6-a Computational Simulation Verification**
Description:	Simulations should be performed on prototype T0,T1,T2, and on-line computing centres and their interactions to reproduce measured behaviour.
Responsible:	Model simulator
Client(s):	Computing Center coordinators and Distributed Computing Developers
End Date:	Before 12/2002
Risks/Constraints:	Simulation must be able to accurately predict computation centre behaviour given a finite set of measured parameters. T0/T1, and T2 coordinators must have faith in the predictive power and reliability of the simulation, otherwise it is pointless to continue with simulation deliverables.
Resource:	01/01/2001 - 31/12/2002: **0.5** FTE (0.5 available). Model simulator.

Deliverable:	**1.6-b Tier1 Simulations**
Description:	Aid Tier1 coordinators in the choice of hardware capability and configuration by supplying simulations of CPU usage, network usage, tape access, etc. Arrive at a system in which simulations can be modified easily, so that proposed changes and solutions can be quickly evaluated.
Responsible:	Model simulator
Client(s):	Tier1 Coordinators
End Date:	After 1/2003
Risks/Constraints:	Simulation program must have been successfully validated, simulation packages must be able to be implemented by users.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.3 available). Model simulator.

Deliverable:	**1.6-c Tier2 Simulations**
Description:	Aid Tier2 coordinators in the choice of hardware capability and configuration by supplying simulations of CPU usage, network usage, tape access, etc. Arrive at a system in which simulations can be modified easily, so that proposed changes and solutions can be quickly evaluated.
Responsible:	Model simulator
Client(s):	Tier2 Coordinators
End Date:	After 1/2003
Risks/Constraints:	Simulation program must have been successfully validated, simulation packages must be able to be implemented by users.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.3 available). Model simulator.

Deliverable:	**1.6-d Simulations of Tier0/Tier1/Tier2 Interactions**
Description:	Simulation of Tier interactions to evaluate network and CPU requirements and bottlenecks for the distributed computing system.
Responsible:	Model simulator
Client(s):	Computing Center Coordinators, Distributed Computing Developers
End Date:	After 1/2003
Risks/Constraints:	Simulation program must have been successfully validated, simulation modules for distributed computing elements must have been developed.
Resource:	01/01/2003 - 31/12/2007: **0.4** FTE (0.4 available). Model simulator.

1.7 T0/T1/T2 Prototypes

These prototypes are required to test all aspects of the computing model including production, data distribution and analysis. They serve both as test facilities for stress-testing the model and as the production centres for the collaborations current large scale data processing, serving and analysis needs.

Deliverable:	**1.7-a Prototype T0/T1 Liaison**
Description:	The T0/T1 test-bed is a critical component of our test strategy. It is typically the largest single facility available, but is only available for 30% of the year to CMS. This makes it valuable to test each level of increasing complexity before that problem is tackled by the remote centres. The liaison deliverable involves negotiating with CERN/IT/Cocotime to have in place the test-bed functionality we require in a timely way and to schedule CMS use of the test-bed. The canonical T0/T1 test-bed in 2004 is expected to have a scale of 84kSI95, 119TB of Disk, 285 TB of active Tape, 487 TB of archive Tape and 148MB/s of tape I/O
Responsible:	T0/T1 Coordinator
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	Common test-bed for all four experiments. No direct authority.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.1 available). Cocotime rear.

Deliverable:	**1.7-b Liaison with Regional Prototype T1 Centres**
Description:	A canonical prototype T1 centre in 2004 would be configured to deliver: about 20 kSI95, 36 TB of Disk, 109 TB of Active tape, 80 TB of archive tape and 74 MB/s of Tape I/O. This corresponds to approximately 50% of an eventual T1 complexity.
Responsible:	RC coordinator
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	
Resource:	01/01/2001 - 31/12/2004: **0.2** FTE (0.1 available). T1/T2 Liaison.

Deliverable:	**1.7-c Prototype T1 Center at FNAL**
Description:	The FNAL T1 centre will be dedicated to CMS and thus available year-round. It must also develop and supply the management ability of the US based prototype T2's
Responsible:	Vivian O'Dell
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	T1 FNAL

Deliverable:	**1.7-d Prototype T1 Center at INFN**
Description:	The INFN T1 centre will be a shared facility, but the CMS share of this centre will be comparable to a canonical T1. It must also develop and supply the management ability of the INFN/CMS based prototype T2's
Responsible:	Paolo Capiluppi
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	T1 INFN

Deliverable:	**1.7-e Prototype T1 Center at Lyon**
Description:	The Lyon centre will be a shared facility. Due to its current activities with Babar it can serve as an information interconnect with the Babar experience. The final CMS share of a Lyon T1 is expected to be of order 30-40%. We assume that we would have access to approximately this percentage of the Lyon facility scaled as a canonical prototype T1
Responsible:	Philippe Mine
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	T1 IN2P3

Deliverable:	**1.7-f Other Prototype T1 Center**
Description:	Place-holder. Special T1 prototypes may be required for countries with particular problems, or the ability to address critical questions effectively
Responsible:	
Client(s):	
End Date:	Ongoing 2001-2004
Risks/Constraints:	Resources?

Deliverable:	**1.7-g Liaison with Prototype T2 Centres**
Description:	We estimate that to fully test the computing model, in particular the ability to effectively use the T2 centres for CMS production purposes and to test their effectiveness to serve the analysis requirements that we will need approximately 10 prototype T2 centres. The scale of a canonical prototype T2 in 2004 would be 7kSI95, 19TB Disk, 9 TB archive tape and 18MB/s of Tape I/O
Responsible:	RC coordinator
Client(s):	The other parts of this subtask
End Date:	Ongoing 2001-2004
Risks/Constraints:	
Resource:	01/01/2001 - 31/12/2004: **0.2** FTE (0.1 available). T1/T2 Liaison.

Deliverable:	**1.7-h US Prototype T2 Centres**
Description:	To stress-test the US T1, both from a computing and management point of view, we estimate that 2-3 prototype T2 centres are required in the US. The aggregate US T2 prototypes should be scaled to match the US T1 computing power, with similar scaling factors for its Disk, Tape and connectivity. At least one of the US T2's will server as to integrate CMS Grid requirements with deliverables of GRID projects.
Responsible:	Lothar Bauerdick
Client(s):	The US T1 centre and US based Physicists
End Date:	Ongoing 2001-2004
Risks/Constraints:	

Deliverable:	**1.7-i UK Prototype T2 Center**
Description:	A key deliverable of this T2 centre will be the integration of CMS facilities with the deliverables of GRID projects. It may connect to a UK based T1 or to a CERN based T1
Responsible:	Dave Newbold/ Dave Collins
Client(s):	A UK T1 centre and UK based Physicists
End Date:	Ongoing 2001-2004
Risks/Constraints:	

Deliverable:	**1.7-j RDMS Prototype T2 Cluster**
Description:	The particular requirements of the RDMS collaboration may be well served by a hybrid "T2 Cluster" of 4-5 tightly coupled T2 centres sharing data storage facilities and with a gateway/buffer to the CERN T0/T1 and the rest of the CMS computing. The RDMS T2 cluster concept will require testing. Special considerations of its typically worse WAN connections must be take into account
Responsible:	Ilyin Vlacheslav / Vladimir Gavrilov ?
Client(s):	RDMS based Physicists
End Date:	Ongoing 2001-2004
Risks/Constraints:	

Deliverable:	**1.7-k INFN Prototype T2 Center**
Description:	A key deliverable of this T2 centre will be the integration of CMS facilities with the deliverables of GRID projects. It would connect to the INFN T1
Responsible:	Paolo Capiluppi
Client(s):	The INFN T1 centre and Italian based Physicists
End Date:	Ongoing 2001-2004
Risks/Constraints:	

Deliverable:	**1.7-l Other Prototype T2 Center**
Description:	Place-holder. Special T2 prototypes may be required for countries with particularly complex connectivity problems. Efficient use of such facilities is vital to CMS and to the remote physicists
Responsible:	
Client(s):	The regional physicists
End Date:	Ongoing 2001-2004
Risks/Constraints:	

2 General CMS Computing and Software Services *(Werner Jank)*

This is supposed to cover the fundamental computing and software infrastructure required for any collaboration. Many, but certainly not all, of the services covered are closely related to those provided in a general way at CERN by the CERN/IT division. Additional CMS-specific tools need to be provided in order to implement functionality required by the software, and to optimise the use of the available resources in the context of the CMS computing model.

All services are developed and made available only on the platforms supported by CMS, i.e. currently Linux on Intel-PC and SUN/Solaris on SPARC.

2.1 General Computing Facilities

CMS has access to computing resources, which are partly dedicated, and partly shared with other experiments and activities. Systems like workgroup servers and batch facilities are mostly managed centrally, while dedicated systems for prototyping work are managed by the collaboration. It is important to provide a computing environment for the user, which is to a large extent identical on all computing facilities where the users have access to.

Deliverable:	**2.1-a CMS Computing and Software Development Environment**
Description:	For every login-session, provide the standard CMS environment (HEPiX settings, shell flags, path settings, CMS flags, .. Creating and adapting software tools that facilitate the production of the software deliverables. Evaluation, configuration and integration of selected commercial development tools. Secure and easy-to-use job-submission, with clear job-status displays, queue manipulation, etc. Dynamic queue setup and configuration.
Responsible:	*Responsible person*
Client(s):	Physicists, offline software developers, engineers.
End Date:	On-going.
Risks/Constraints:	On shared facilities, some configurations might be difficult to achieve. Online software may require (partially) different settings.
Resource:	01/01/2001 - 31/12/2007: **1.0** FTE (1.0 available). Toolsmith/UserEnviron..
Resource:	01/01/2004 - 31/12/2007: **0.5** FTE (0.0 available). Toolsmith/UserEnviron..

Deliverable:	**2.1-b Tools for Data preparation for processing, Data search, Data recovery**
Description:	Tools for preparation of data for processing, like data (pre)staging, distribution, replication, re-clustering. Data location search, browsing (meta data). Data recovery after mistake, error, malfunction.
Responsible:	*Responsible person*
Client(s):	Physicist, Production manager.
End Date:	On-going.
Risks/Constraints:	Available resources (e.g. disk space, system throughput, available network bandwidth. Data model, persistency not yet final. Some tools mainly for expert use.
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.0 available). Database SE.
Resource:	01/01/2002 - 31/12/2007: **0.3** FTE (0.0 available). Database SE.

Deliverable:	**2.1-c Computing administration and operations**
Description:	Provide tools for monitoring (e.g. system/CPU/disk usage, performance, ..), error logging, etc.. Use tools on regular basis to produce necessary statistical data.
Responsible:	*Responsible person*
Client(s):	Computing managers, system administrators, developers.
End Date:	On-going.
Risks/Constraints:	System information partly restricted.
Resource:	01/01/2001 - 31/12/2007: **0.5** FTE (0.4 available). Sys Admin OP.

2.2 System Support and System Administration

All systems used (e.g. batch servers, workgroup servers, prototyping systems and desktop) need on-going support and administration. Stable running and efficient usage have to be guaranteed. Evaluation of new products, versions and features have to be made.

Deliverable:	**2.2-a Hardware configuration**
Description:	Hardware configuration has to be adapted to specific use (e.g. prototyping, disk servers, LANs). This implies installation, configuration, management and trouble-shooting of hardware modules.
Responsible:	*Responsible person*
Client(s):	System manager, production manager, developer.
End Date:	On-going.
Risks/Constraints:	Breaking of warranty. Restrictions on LAN, as required by CERN/IT.
Resource:	01/01/2001 - 31/12/2007: **0.3** FTE (0.3 available). Sys Admin HW.

Deliverable:	**2.2-b System support and administration**
Description:	Installation, configuration, administration, trouble-shooting of standard (full CMS support) and prototyping systems. • Operating system, developer environments and compilers (C, C++, java, f77) • Utilities (shells, Perl, web-browsers, etc.) • Disk and network configuration (switches, up-links) • Backups (system and user files), archiving • etc...
Responsible:	*Responsible person*
Client(s):	System manager, production manager, developer.
End Date:	On-going.
Risks/Constraints:	Version management. Disturbance of LAN.
Resource:	01/01/2001 - 31/12/2007: **0.3** FTE (0.3 available). Sys Admin SW.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). Sys Admin SW.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.0 available). Sys Admin SW.

2.3 Information Systems

This item covers the construction, operation, and maintenance of the collaboration information systems.

Deliverable:	**2.3-a Deployment and Operation of WWW Server**
Description:	Deployment and operation of several kind of www-servers. Support is provided for • Outreach server (cmsinfo) • Workhorse server (cmsdoc) • Special, secure server (FB, MB, SC, ..) • Project and people home-pages • Web-based download • cgi-scripts, php support, servelets • ftp server • Automated support for meeting organisation (agenda, minutes, news, documents handling) • Global search features
Responsible:	Jean-Pierre Porte, Nick Sinanis
Client(s):	Collaboration and general public.
End Date:	On-going.
Risks/Constraints:	Secure access required.
Resource:	01/01/2001 - 31/12/2007: **0.7** FTE (0.4 available). Info System WWW.
Resource:	01/01/2002 - 31/12/2007: **0.3** FTE (0.0 available). Info System WWW.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.0 available). Info System WWW.

Deliverable:	**2.3-b Deployment and Maintenance of Collaboration Database System**
Description:	Collaborating institutes and people database. Advanced search features. Output selection and formatting (e.g. printable address labels).
Responsible:	Jean-Pierre Porte, secretariat
Client(s):	Collaboration, secretariat.
End Date:	On-going.
Risks/Constraints:	Personal data privacy.
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.2 available). Info System SUPP.

Deliverable:	**2.3-c System for Storing Documents (Technical Notes, etc.)**
Description:	Document repository, with advanced search features. Format conversion and checking. Support for writing (e.g. templates), submission and approval.
Responsible:	Jean-Pierre Porte
Client(s):	Collaboration, secretariat.
End Date:	On-going.
Risks/Constraints:	Checking for print-ability difficult.
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.2 available). Info System SUPP.

Deliverable:	**2.3-d Development and Maintenance of CCS WWW pages**
Description:	All information and documentation of CCS relevant material.
Responsible:	*Responsible person*
Client(s):	People active in CCS. Collaboration.
End Date:	On-going.
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.1 available). Info System CCS.

2.4 Collaboration Systems

This item covers the construction, operation, and maintenance of the collaboration information and support systems.

Deliverable:	**2.4-a Distributed Software Support System**
Description:	For the distributed developers and users community, a software repository and distribution system is required. Infrastructure and tools need to be installed, configured and maintained.
Responsible:	*Responsible person*
Client(s):	Developers, Users.
End Date:	On-going
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.1 available). Librarian Assistant.

Deliverable:	**2.4-b E-mail systems including Lists**
Description:	List-driven e-mail system, where lists can come from subscription, expression of interest. Duplication of e-mail should be avoided.
Responsible:	Nick Sinanis, Jean-Pierre Porte
Client(s):	Collaboration.
End Date:	On-going.
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.1 available). Collab Sys SUPP.

Deliverable:	**2.4-c News System**
Description:	Announcements, with archive and search feature.
Responsible:	Jean-Pierre Porte
Client(s):	Collaboration.
End Date:	On-going.
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.1 available). Collab Sys SUPP.

Deliverable:	**2.4-d Calendar System**
Description:	Personal and group calendars. Conference room booking.
Responsible:	*Responsible person*
Client(s):	Collaboration, secretariat.
End Date:	On-going.
Risks/Constraints:	To be linked to the video-conferencing system.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). Collab Sys SUPP.

Deliverable:	**2.4-e Collaborative Working Tools**
Description:	This task includes (possibly) development and (definitely) support of network-based collaborative working tools such as videoconferencing, which are invaluable to the highly distributed members of any HEP collaboration.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.5** FTE (0.0 available). Collab Sys SUPP.
Resource:	01/01/2002 - 31/12/2007: **0.5** FTE (0.0 available). Collab Sys SUPP.
Resource:	01/01/2005 - 31/12/2007: **0.5** FTE (0.0 available). Collab Sys SUPP.

2.5 Problem reporting system

Problem Resolution ensures that problems reported are actually resolved in a well understood manner, and that trends or problematic areas are recognised. The work necessary to ensure that all discovered problems are analysed and fixed will be identified. Reports will be created when problems are found in a piece of software or an activity, and a mechanism of identifying and acting on trends in problems will be established.

Deliverable:	**2.5-a Problem reporting system**
Description:	Establish and deploy a problem reporting system, that allows to ensure problems can be reported, described, noted, analysed, classified, re-directed, traced, archived, etc.. Grouping of problems (FAQs) and retrieval with a search facility.
Responsible:	*Responsible person*
Client(s):	Developers, Users.
End Date:	On-going.
Risks/Constraints:	Useful, once project areas and base-lined products or processes are available. Difficult to add specific features to tools existing in shared facilities.
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.0 available). ProbReport SE.

Deliverable:	**2.5-b Maintained action list**
Description:	Take note, prioritise problems, initiate actions, and track them to closure.
Responsible:	*Responsible person*
Client(s):	Developers.
End Date:	On-going.
Risks/Constraints:	Should be there now, independent of a formal problem reporting.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). ProbReport SE.

Deliverable:	**2.5-c Closed problem**
Description:	Review the solutions to problems as they come in, and distribute the corresponding software, documentation, etc..
Responsible:	*Responsible person*
Client(s):	Developers, Users.
End Date:	On-going.
Risks/Constraints:	Assumes that we have any problems.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). ProbReport SE.

Deliverable:	**2.5-d Trend analysis**
Description:	Collect and analyse fault occurrences, frequency, correlation with coding habits, etc., and feed results back into the relevant processes.
Responsible:	*Responsible person*
Client(s):	Developers, project managers.
End Date:	On-going.
Risks/Constraints:	Assumes the above is in active use for some time.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). ProbReport SE.

3 Architecture Frameworks and Toolkits *(Vincenzo Innocente)*

This task covers the implementation, support and documentation of the software foundation on which the applications are built on. The three parts of the foundation are the architecture, the frameworks and the toolkits.
The architecture describes the model or blueprint of the key components of the system: what they are, how they behave, how they interact and so forth. The model is implemented through a main framework and several auxiliary frameworks for specific tasks. Examples of the latter are frameworks for geometry database, visualisation or calibrations. Finally, toolkits define a common language for all the software as highly reusable classes for containers, physics quantities, algorithms and so forth.

3.1 Software Architecture

This item covers the definition and evolution of the model for the software systems. It defines the key components, including what they are, how they behave, how they interact with each other, what their design is, and how they are partitioned physically. The item also includes documentation on how the architecture was derived: the most important use cases and requirements, analyses of the problem domain, and key decisions made.

Deliverable:	**3.1-a Tools to Create and Manage Architecture Document Views**
Description:	Tools to document the many aspects of the software architecture. They provide a means to generate several consistent documents from a pool of information describing the architecture. That is, each produced document is a view to some aspect of the architecture. The tools will guarantee that different documents are consistent when they have drawn from the same pool originally. They also hyper-link the generated documents as one web.
Responsible:	Deputy Architect
Client(s):	Architecture document authors, PRS groups
End Date:	30/6/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/09/2000 - 31/12/2001: **0.20** FTE(0.20 available).Architect.
Resource:	01/01/2002 - 31/12/2007: **0.10** FTE(0.10 available).Architect.

Deliverable:	**3.1-b Top-Level Architectural Description**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect
Client(s):	All Software Developers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	It should be published as a CMS internal note.
Resource:	01/09/2000 - 30/06/2002: **0.30** FTE(0.30 available).Architect.
Resource:	01/07/2002 - 31/12/2007: **0.10** FTE(0.10 available).Architect.

Deliverable:	**3.1-c Top-Level Core Framework Description**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	It should be published as a CMS internal note.
Resource:	01/09/2000 - 30/06/2002: **0.30** FTE(0.10 available).Architect.
Resource:	01/07/2002 - 31/12/2007: **0.10** FTE(0.10 available).Architect.

Deliverable:	**3.1-d Top-Level Framework Specialisation Descriptions**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	It should be published as a CMS internal note.
Resource:	01/09/2000 - 31/12/2002: **0.20** FTE(0.00 available).Framework Eng.
Resource:	01/01/2003 - 31/12/2007: **0.10** FTE(0.10 available).Framework Eng.

Deliverable:	**3.1-e Background Document on CMS Physics Analysis Strategy**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	It should be published as a CMS internal note.

Deliverable:	**3.1-f Background Document on CMS System Architecture for Computing for Physics Analysis**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	It should be published as a CMS internal note.

Deliverable:	**3.1-g Background Document on CMS System Architecture for Computing for Online Event Filtering and Monitoring**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	It should be published as a CMS internal note.

3.2 Software Framework

The foundation of the CMS software is a professionally engineered framework into which physics modules may be inserted. the framework should support standard operations performed by physicists, including: accessing the CMS data store; selection and classification of events; the ability to apply calibration algorithms; invocation of standard or custom-built reconstruction algorithms; interactive visualisation and physics analysis systems with presentation-quality output; and creation of user-defined transient or persistent objects. The user of the framework will be able to choose what specific actions to perform and which specific algorithms to use even at run-time or interactively.

Deliverable:	**3.2-a Framework Design Document**
Description:	N.B. This is similar to the "Description" items in the architecture section. Essentially the "Description" and "Design" documents are two different things: the former is a top level design, this one here is a complete design. Whether we want to specify that we want both I (= Lassi) am not sure, getting even one of them would be fabulous. It should be published as a CMS internal note.
Resource:	01/09/2000 - 31/12/2002: **0.20** FTE(0.00 available).Framework Eng.
Resource:	01/01/2003 - 31/12/2007: **0.10** FTE(0.10 available).Framework Eng.
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	

Deliverable:	**3.2-b Framework for use by Reconstruction Software**
Description:	The current version of the "CMS Analysis and Reconstruction Framework" known as CARF, provides the user with an intuitive and flexible means of performing analysis and reconstruction tasks. CARF uses an ODBMS to store objects persistently and will provide classes and methods to shield end-users from details of the ODBMS storage and access mechanisms, mostly in terms of C++ smart-references and smart-iterators.
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 4.5: 30/04/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/1999 - 31/03/2001: **2.00** FTE(1.00 available).Framework Eng.

Deliverable:	**3.2-c Common Framework for use in Software for Physics**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.30** FTE(0.20 available).Framework Eng.
Resource:	01/01/2003 - 31/12/2004: **0.60** FTE(0.30 available).Framework Eng.
Resource:	01/01/2005 - 31/12/2007: **0.50** FTE(0.30 available).Framework Eng.

Deliverable:	**3.2-d Creation of an Independent Releasable Unit for the Framework**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Framework Engineer
Client(s):	Framework Engineers
End Date:	01/05/2001
Risks/Constraints:	To be done, no matter what risk involved.
Resource:	01/04/2001 - 01/05/2001: **0.20** FTE(0.20 available).Framework Eng.

3.3 Software Framework Specialisations

Place-holder for other frameworks we will need.

Deliverable:	**3.3-a Framework Specialisation for Simulation**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 2: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/04/2001 - 31/12/2002: **0.3** FTE (0.1 available). Framework Eng.
Resource:	01/02/2003 - 31/12/2004: **0.6** FTE (0.1 available). Framework Eng.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.1 available). OSCAR Eng.

Deliverable:	**3.3-b Framework Specialisation for Reconstruction**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 2: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/04/2001 - 31/12/2002: **0.2** FTE (0.1 available). Framework Eng.
Resource:	01/09/2003 - 31/12/2004: **0.6** FTE (0.1 available). ORCA Eng.
Resource:	01/09/2002 - 31/12/2007: **0.3** FTE (0.3 available). ORCA Eng.

Deliverable:	**3.3-c Framework Specialisation for Production Meta-Data Management**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 2: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.2 available). Framework Eng.
Resource:	01/01/2003 - 31/12/2004: **0.5** FTE (0.1 available). Framework Eng.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.1 available). Framework Eng.

Deliverable:	**3.3-d Auxiliary Framework for Interactive Analysis**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Chief Architect & Chief Framework Engineer
Client(s):	All Software Developers
End Date:	Version 2: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.2 available). Framework Eng.
Resource:	01/01/2003 - 31/12/2004: **0.6** FTE (0.3 available). Framework Eng.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.3 available). Framework Eng.

3.4 Toolkits

The toolkits needed by the project.

CMS philosophy is to encourage the use of a common set of basic components (externally or internally developed) for all kind of basic computing services. External components requires integration, maintenance and upgrades and form a basic configuration common to all CMS physics-software projects.

Internally developed components will be organised into toolkits. Each toolkit is a collection of rather independent software units that could be used in several contexts.

A toolkit depends on a limited and well defined set of external libraries of which, usually, extends and/or adapts functionality and interface.

Toolkits are released together with the corresponding Framework Specialisation.

Deliverable:	**3.4-a Integration Maintenance and Upgrades of non-CMS Software used by CMS Physics-Software**
Description:	The philosophy of CMS is to exploit non-CMS software wherever possible, including Anaphe, HEP-wide, public-domain, and commercial components. While this strategy saves development time it does imply the need for non-trivial work to integrate and upgrade the external software. All CMS software projects are encouraged to use the same components and therefore this task should be centrally coordinated.
Responsible:	Toolkits coordinator.
Client(s):	CCS and PRS developers and users.
End Date:	Done; ongoing support.
Risks/Constraints:	Risks here...
Resource:	01/01/2001 - 30/06/2003: **0.2** FTE (0.2 available). Toolkit Eng.
Resource:	01/07/2003 - 31/12/2007: **0.5** FTE (0.5 available). Toolkit Eng.

Deliverable:	**3.4-b Basic class libraries**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	All Software Developers
End Date:	Version 1.0: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.30** FTE(0.30 available).Toolkit Eng.
Resource:	01/01/2003 - 31/12/2007: **0.60** FTE(0.30 available).Toolkit Eng.

Deliverable:	**3.4-c Persistent Basic class libraries**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers
End Date:	Version 1.0: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.20** FTE(0.20 available).Toolkit Eng.
Resource:	01/01/2003 - 31/12/2004: **0.50** FTE(0.20 available).Toolkit Eng.
Resource:	01/01/2005 - 31/12/2007: **0.70** FTE(0.20 available).Toolkit Eng.

Deliverable:	**3.4-d Specific toolkit for G3/CMSIM**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers, PRS Simulation
End Date:	Version 1.0: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/05/2001 - 31/06/2003: **0.10** FTE(0.10 available).OSCAR Eng.

Deliverable:	**3.4-e Specific toolkit for G4**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers, PRS Simulation
End Date:	Version 1.0: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/04/2001 - 31/12/2001: **0.30** FTE(0.30 available).OSCAR Eng.
Resource:	01/01/2002 - 31/12/2003: **0.50** FTE(0.50 available).OSCAR Eng.
Resource:	01/06/2004 - 31/12/2007: **0.30** FTE(0.30 available).OSCAR Eng.

Deliverable:	**3.4-f Specific toolkit for Data Acquisition Environment**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers, PRS Simulation
End Date:	Version 1.0: 31/12/2002
Risks/Constraints:	*N.B. no resources assigned – covered in online part ???*
Resource:	01/01/2002 - 31/12/2003: **0.10** FTE(0.10 available).ONLINE Eng.
Resource:	01/01/2004 - 31/12/2007: **0.50** FTE(0.10 available).ONLINE Eng.

Deliverable:	**3.4-g Specific toolkit for Grid Environment**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers, PRS Simulation
End Date:	Version 1.0: 31/12/2002
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 01/05/2003: **0.50** FTE(0.00 available).Grid Eng.
Resource:	01/05/2003 - 31/12/2007: **1.00** FTE(0.00 available).Grid Eng.

Deliverable:	**3.4-h Specific toolkit for Visualisation**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Toolkits coordinator.
Client(s):	Frameworks Developers, PRS Visualisation
End Date:	Version 1.0: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Visualisation Eng.
Resource:	01/01/2003 - 31/12/2007: **0.5** FTE (0.0 available). Visualisation Eng.

3.5 Integration of Framework and Grid Services

Deliverable:	**3.5-a Requirement and Constraint Document to the Framework from Grid Infrastructure.**
Description:	*...type some explanatory text here...*
Responsible:	Grid Engineer
Client(s):	Architect, Framework Engineers
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/06/2001 - 31/12/2002: **0.20** FTE(0.00 available).Grid Eng.
Resource:	01/01/2003 - 31/12/2007: **0.1** FTE (0.00 available).Grid Eng.

Deliverable:	**3.5-b Requirement and Constraint Document from the Framework to Grid Services.**
Description:	*...type some explanatory text here...*
Responsible:	Grid Engineer
Client(s):	Grid Engineer, Architect, Framework Engineers
End Date:	Version 1: 31/12/2002
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/06/2001 - 31/12/2002: **0.20** FTE(0.00 available).Grid Eng.
Resource:	01/01/2003 - 31/12/2007: **0.1** FTE (0.00 available).Grid Eng.

Deliverable:	**3.5-c Integration of Framework and Grid Services.**
Description:	*...type some explanatory text here...*
Responsible:	Grid Engineer
Client(s):	Grid Engineer, Architect, Framework Engineers
End Date:	Version 1: 31/12/2002
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2003: **0.50** FTE(0.00 available).Grid Eng.
Resource:	01/01/2004 - 31/12/2005: **1.50** FTE(0.00 available).Grid Eng.
Resource:	01/01/2006 - 31/12/2007: **1.0** FTE (0.00 available).Grid Eng.

3.6 Interactive Graphics Toolkits

For the moment, this means the “Interactive Graphical User Analysis (IGUANA)” software. The IGUANA software project addresses interactive visualisation software needs for three domains:

- graphical user interfaces (GUI's);
- interactive detector and event visualisation; and
- interactive data analysis and presentation;

for use in a variety of areas such as offline simulation and reconstruction, data analysis, and test beams. Tasks include the assessment of use-cases and requirements and the evaluation, integration, adaptation, verification, deployment, and support in the CMS environment of visualisation software from HEP, academia, the public domain, and the commercial sector.
Pre-existing software is exploited as much as possible to optimise the use of the resources available. Therefore, a significant component of this task will be the assessment of available tools and their adaptation, extension, deployment, and support in the CMS environment.

Deliverable:	**3.6-a Document describing the use cases and scenarios for interactive analysis**
Description:	In order to ensure delivery of anything useful from IGUANA it is imperative to re-evaluate the mission and priorities of IGUANA, following the delivery of the "Functional Prototype" software in October 2000 (CMS Note IN 2000/052). The use-cases and scenarios should come from the target IGUANA clients who ultimately should include the whole collaboration. For this deliverable it is assumed that the use-cases and scenarios will be collected by the Cafétask force from a variety of sources especially people involved in the CCS, RPROM, SPROM, and the PRS activities.
Responsible:	Cafétask force.
Client(s):	IGUANA developers.
End Date:	April 2001 *(check this with Café!)*
Risks/Constraints:	The document describing the use cases and scenarios should be approved by their sponsors and the CPT project management. It should be published as a CMS internal note.
Resource:	01/03/2001 - 31/09/2001: **0.1** FTE (0.0 available). Visualisation Eng.
Resource:	01/01/2002 - 31/12/2007: **0.05** FTE(0.0 available). Visualisation Eng.

Deliverable:	**3.6-b Requirements document derived from on an analysis of the use-cases and scenarios**
Description:	The requirements should be specified as derived from the use-cases and scenarios. Additional assumptions and constraints, if any, should be clearly described. The document should arrange the requirements according to natural sub-tasks of IGUANA and ensure that the boundaries between IGUANA and other projects are clear.
Responsible:	IGUANA coordinator.
Client(s):	IGUANA developers.
End Date:	Approximately two months after the use-cases and scenarios have been completed and agreed upon by their respective sponsors, i.e. June 2001.
Risks/Constraints:	The requirements document should be approved by the use-case sponsors and the CPT project management. It should be published as a CMS internal note.
Resource:	01/09/2001 - 01/03/2002: **0.2** FTE (0.1 available). Visualisation Eng.
Resource:	01/01/2003 - 31/12/2007: **0.05** FTE(0.05 available).Visualisation Eng.

Deliverable:	**3.6-c IGUANA Repository using the CMS-standard Configuration Management System**
Description:	This item consists of a coherent Software Infrastructure including a software repository, multi-platform build, release, distribution, and documentation systems, and regular public versioned releases of both software and documentation. All aspects of this infrastructure should exploit common CMS tools and procedures as much as possible.
Responsible:	IGUANA coordinator.
Client(s):	IGUANA developers.
End Date:	Already established. Support is an ongoing activity.
Risks/Constraints:	This is absolutely required. The maintenance of this infrastructure requires ongoing effort from qualified personnel.
Resource:	01/01/2001 - 31/12/2003: **0.1** FTE (0.1 available). Visualisation Eng.
Resource:	01/01/2004 - 31/12/2007: **0.3** FTE (0.1 available). Visualisation Eng.

Deliverable:	**3.6-d Generic Software for Event Display**
Description:	Event visualisation task covers the visualisation of the simulated and reconstructed data. It applies to both the underlying software packages as well as the specific applications developed within CMS. As a general principle, we aim for the well-known and successful Model-View-Controller paradigm in which the visualisation is divided into three largely independent parts: the *model*, which constitutes the underlying data to be visualised; the *view*, which is the representation of the data on a display; and the *controller*, which handles interactions between the user and the model and/or the view. This philosophy is reflected in the subdivision of this task into subtasks that relate to the underlying graphics engines, viewers and representations for CMS-related data.
Responsible:	IGUANA coordinator.
Client(s):	RPROM and PRS groups.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Event display package relies heavily on externally developed an supported software.
Resource:	01/01/2001 - 31/12/2001: **0.3** FTE (0.1 available). Visualisation Eng.
Resource:	01/01/2002 - 31/12/2007: **0.6** FTE (0.1 available). Visualisation Eng.

Deliverable:	**3.6-e Detector Description Browsing and Visualisation**
Description:	This task is used to examine the contents of the Detector Description and perform 3D visualisation of the contents. Visualisation serves as an important debugging tool to verify the contents of the Detector Description.
Responsible:	IGUANA Coordinator.
Client(s):	Detector description, SPROM, RPROM, and PRS groups.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	It is assumed that all the detector-specific work is carried out by the sponsors.
Resource:	01/01/2001 - 31/12/2001: **0.1** FTE (0.0 available). Visualisation Eng.
Resource:	01/01/2002 - 31/12/2003: **0.6** FTE (0.0 available). Visualisation Eng.
Resource:	01/01/2004 - 31/12/2007: **0.3** FTE (0.0 available). Visualisation Eng.

Deliverable:	**3.6-f Event Collection Browsing and Manipulation Tools**
Description:	This task provides, in conjunction with the CMS framework (and production tools), interactive tools which facilitate the users interaction and manipulation of event collections. In particular, they should support: browsing of meta-data associated to event collections; the creation of user collections; the creation of deep or shallow copies; and support for miscellaneous database administration tasks such as cloning, cleaning and deleting of events/collections.
Responsible:	IGUANA coordinator.
Client(s):	Users of CMS event collections, particularly the RPROM and PRS groups and probably the production teams.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Visualisation Eng.
Resource:	01/01/2003 - 31/12/2007: **0.6** FTE (0.0 available). Visualisation Eng.

Deliverable:	**3.6-g Integration of non-CMS Data Analysis and Presentation Tools**
Description:	This task involves the integration and support of data presentation tools, such as histogram plotting and numerical fitting packages into the CMS analysis environment. Developing tools to plot and manipulate persistent histograms stored in the database.
Responsible:	IGUANA coordinator.
Client(s):	CMS Users Performing Analysis
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	This is assumed to be primarily an integration task with most of the underlying technology developed within Lizard and other off-project efforts.
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.1 available). SW Eng.
Resource:	01/01/2003 - 31/12/2004: **0.6** FTE (0.1 available). SW Eng.
Resource:	01/01/2005 - 31/12/2007: **0.8** FTE (0.1 available). SW Eng.

Deliverable:	**3.6-h Deployment of a GUI builder**
Description:	Down-loading of a pre-existing GUI builder (e.g. QtArchitect), building it on standard CMS platforms, and installing it in a generally accessible place.
Responsible:	IGUANA coordinator.
Client(s):	IGUANA developers and possibly developers of graphics applications which use the same GUI tools as IGUANA.
End Date:	We should just do it...it only takes a day or so...
Risks/Constraints:	None.

Deliverable:	**3.6-i GUI Widgets Library**
Description:	*Elaborate on purpose and functionality.*
Responsible:	IGUANA coordinator.
Client(s):	Visualisation Eng
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2003: **0.2** FTE (0.1 available). Visualisation Eng.
Resource:	01/01/2004 - 31/12/2007: **0.4** FTE (0.1 available). Visualisation Eng.

3.7 Detector Description

This task aims to provide an environment for creating, manipulating, and using the parameters describing the CMS detector in a consistent manner. In particular, it covers the geometrical description of the detector elements at various levels (full engineering detail, full GEANT detail, fast simulation, trigger tower geometries, etc.), associated material properties, magnetic field map, etc. The Detector Description sub-system will serve a number of clients, including OSCAR, the Fast Simulation, ORCA, the Calibration, and the User Analysis Environment. Deliver tools to encapsulate detector description at the various degrees of precision required for CMS software tasks.
Provide an environment for creating manipulating, and using parameters describing the CMS detector in a consistent manner.
Geometry description of the detector elements at various levels (full engineering detail, full GEANT detail, fast simulation, trigger tower geometries, etc.), associated material properties, and magnetic field map.
The sub-system will serve a number of clients including ORCA, OSCAR, Fast Simulation, Calibration, and User Analysis Environment.

Deliverable:	**3.7-a Central Repository of Detector Description Data**
Description:	*Elaborate on purpose and functionality.*
Responsible:	Detector Description Coordinator
Client(s):	Toolkit Engineers, PRS Group
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2001: **0.1** FTE (0.0 available). DD Eng.
Resource:	01/01/2002 - 31/12/2003: **1.0** FTE (0.0 available). DD Eng.
Resource:	01/01/2004 - 31/12/2007: **0.5** FTE (0.0 available). DD Eng.

Deliverable:	**3.7-b Interfaces to Engineering Descriptions of Data**
Description:	*Elaborate on purpose and functionality.*
Responsible:	DDD Coordinator
Client(s):	Toolkit Engineers, PRS Group
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2001: **0.1** FTE (0.0 available). DD Eng.
Resource:	01/01/2002 - 31/12/2003: **0.5** FTE (0.0 available). DD Eng.
Resource:	01/01/2004 - 31/12/2007: **0.3** FTE (0.0 available). DD Eng.

Deliverable:	**3.7-c Interfaces to Simulation, Reconstruction, and Analysis Software**
Description:	*Elaborate on purpose and functionality.*
Responsible:	DDD Coordinator
Client(s):	Toolkit Engineers, PRS Group
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2001: **0.2** FTE (0.2 available). DD Eng.
Resource:	01/01/2002 - 31/12/2007: **0.6** FTE (0.3 available). DD Eng.

Deliverable:	**3.7-d Magnetic Field Description**
Description:	*Elaborate on purpose and functionality.*
Responsible:	DD Coordinator
Client(s):	Toolkit Engineers, PRS Group
End Date:	Version 1: 31/12/2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/06/2001 - 31/12/2003: **0.3** FTE (0.0 available). DD Eng.
Resource:	01/01/2004 - 31/12/2007: **0.1** FTE (0.0 available). DD Eng.

3.8 Technology Tracking, Evaluation and Baseline Choices

In a fast evolving environment such as IT, technology tracking is essential. Each time a new technology and/or a new product become available, its impact on our computing and software system has to be evaluated. If it is relevant a proper R&D program, including unit testing, simple prototyping and integration in the current CMS computing and software system, has be be organised. If successful the new technology/product can became a baseline choice. A baseline technology/product still requires tracking to follow its evolution, test and eventually import new versions, detect possible obsolescence and consequently plan a migration to a new technology/product. Basic deliverables are evaluation documents, locally installed versions, and, if relevant, unit and integration test suites for functionality, performance and regression.

The evaluation results and the baseline choice of technologies should be documented in a CMS internal note. The baseline choice should be approved by the CPT project management.

Deliverable:	**3.8-a Computing, Networking and Mass Storage Performance**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-b Databases and Data Storage Technologies**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-c Distributed Computing Technologies**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-d Software Analysis and Design Methods**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-e Object Oriented Technologies**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-f Software Framework Technologies**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-g Graphics Hardware and Software**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-h OS's and compilers**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-i Yet unknown products if it's relevant**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**3.8-j Technology report**
Description:	Evaluation of new technologies, using prototyping, with the goal of finding better arrangements for the main risks, and/or removing technology related constraints from software and system.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Assumes that the system constraints and architecturally relevant use-cases available; main risks are understood and currently planned arrangements are documented. Link between system and software constraints and technology understood and documented. The resource below above refers also to the above deliverables. Resources will show a peak about around end of 2003 (3 years before turn on) for choices of various software to be used at turn on.
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Re-use engineer.
Resource:	01/01/2003 - 31/12/2004: **1.5** FTE (0.0 available). Re-use engineer.
Resource:	01/01/2005 - 31/12/2007: **1.0** FTE (0.0 available). Re-use engineer.

4 Software Users and Developers Environment *(Stephan Wynhoff Ad-interim)*

This item covers development and support for the CMS software and environment including the associated code and configuration management systems, version control mechanisms, change control and the code and software release, distribution, and build procedures. An important aspect of this task is the porting, technical verification, and support of CMS and external code on multiple systems. It also needs to provide suitable tools for developers and feedback and training for users.

4.1 Software Development Infrastructure

This item covers the infrastructure supporting the processes associated with the definition, design, development, documentation, integration, verification, deployment, and maintenance of the CMS Software with the aim of optimising efficiency and quality. The pragmatic ”Cyclic Life Cycle” model has been adopted by CMS that emphasises continuous improvement following ISO/IEC 15504 (SPICE). Items which have been implemented include the structure of the ORCA, OSCAR, FAMOS, and IGUANA software repository and the strategy for development, release and testing, and the CMS coding rules, guidelines, and style. Processes currently under construction and only partly deployed include the more comprehensive assessment of user requirements, checking of software dependencies between software sub-systems and packages, automated checking of coding rule and style conformance, and more comprehensive integration test suites and examples. Processes to be implemented more rigorously in future include: more formal and uniform software requirements analysis and design procedures; documentation of code design, implementation, and usage; and problem reporting, tracking and resolution mechanisms. Deliver tools and methodologies to encourage and support efficient software management and quality assurance. The task here in more general terms is to establish a set of organisational processes for all software life-cycle activities, based on organisational alignment with the goals of our experiment, to assess in how far the different areas are indeed relevant to CMS and contributing to our success, and to improve the important processes continuously to the level where effort and gain are judged to be balanced in view of our goal of taking data doing great physics.

Deliverable:	**4.1-a Configuration management strategy**
Description:	Write up a configuration management strategy, which includes all activities of configuration management, and a schedule for performing them.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**4.1-b Configuration description**
Description:	Write and maintain an up to date list of all configuration items, including their eventual decomposition into lower level configuration items, who is responsible for each item, and when it is to be placed under configuration management.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.2** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.1-c Configuration history**
Description:	Ensure the maintenance of each configuration item in sufficient detail that previous base-lines can be recovered, when required.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**4.1-d Configuration status report**
Description:	Make available the status of each configuration item, like external library, or some package library and headers, and their relationships in the current or base-lined system state.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**4.1-e SCRAM development and support**
Description:	Basic process framework for plug-in of process support tools. Native to SCRAM are among others active doc, and bootstrap mechanisms and build system.
Responsible:	*Responsible person*
Client(s):	All CMS software development
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/02/2001 - 31/12/2007: **0.4** FTE (0.0 available). tool-smith.

Deliverable:	**4.1-f CVSpm support**
Description:	Infrastructure on top of which project management can be built up.
Responsible:	*Responsible person*
Client(s):	All CMS software development
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/02/2001 - 31/12/2007: **0.1** FTE (0.1 available). tool-smith.

Deliverable:	**4.1-g cvs-server and repository maintenance**
Description:	Infrastructure on top of which configuration management can be built up.
Responsible:	*Responsible person*
Client(s):	All CMS software development
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/02/2001 - 31/12/2007: **0.1** FTE (0.1 available). tool-smith.

Deliverable:	**4.1-h Code Wizard and deployment and support**
Description:	Tool for checking coding rules.
Responsible:	*Responsible person*
Client(s):	All CMS software development
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/03/2002 - 31/12/2007: **0.1** FTE (0.0 available). tool-smith.

Deliverable:	**4.1-i McCabe deployment**
Description:	Tool for measurement and study of software quality,
Responsible:	*Responsible person*
Client(s):	All CMS software development
End Date:	Stalled due to loss of manpower
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 30/06/2002: **0.4** FTE (0.0 available). tool-smith.
Resource:	01/07/2002 - 31/12/2007: **0.2** FTE (0.0 available). tool-smith.

Deliverable:	**4.1-j Header File Checking Tool**
Description:	A tool (e.g. integrated with scram build command) to go over every header file, and for each one produce a `.cxx` file that includes just that header (and Architecture.h?). It would be used to check whether that header is stand-alone. Output could be of the form: `X/Y/interface/Z.h: PASS` in the event of success, or: `X/Y/interface/Z.h: FAIL` <`compiler error messages`> in the event of failure.
Responsible:	*Responsible person*
Client(s):	All software developers.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/03/2002: **0.5** FTE (0.5 available). Toolsmith/engineer.

Deliverable:	**4.1-k Development/Deployment of a Software Dependency Analyser**
Description:	Tool for checking and displaying dependencies, and release phases, and well as checking style rules. Includes packaging metrics, and selected OO metrics.
Responsible:	*Responsible person*
Client(s):	QA and integration
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2003: **0.5** FTE (0.0 available). toolsmith.
Resource:	01/02/2004 - 31/12/2007: **0.3** FTE (0.0 available). toolsmith.

Deliverable:	**4.1-l Coding rule and style rule checker**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	All software developers.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2007: **0.0** FTE (0.0 available). toolsmith.

Deliverable:	**4.1-m Validation infrastructure**
Description:	Provide the infrastructure (OVAL) for running validation tests in regression.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Can start now, but will have to turn into an ongoing activity.
Resource:	01/02/2001 - 31/12/2007: **0.5** FTE (0.5 available). tool-smith.

Deliverable:	**4.1-n Assessment record**
Description:	Define the method to be used for process assessments, and the goals of the assessment. Include the assessment inputs and the plan for the assessment. Collect relevant information and validate this information. Identify strength and weaknesses. Maintain, report, and exploit the assessment results
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Improvement activity is scoped.
Resource:	01/01/2003 - 31/12/2004: **0.4** FTE (0.0 available). Process assessment team.
Resource:	01/01/2005 - 31/12/2007: **0.2** FTE (0.0 available). Process assessment team.

Deliverable:	**4.1-o Process document templates**
Description:	Produce a set of document templates for the agreed on documents.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Documentation policy and documentation infrastructure available.
Resource:	01/06/2002 - 31/06/2001: **0.1** FTE (0.0 available). Toolsmith/engineer.

4.2 CMS Software release and distribution

Run integration and acceptance test for all releasable CMS software. Provide tools to detect potential problems early. Distribute released CMS software.

Deliverable:	**4.2-a Preparation of releases and installation at CERN**
Description:	This task covers the preparation and installation of the CMS software in the central release area in various combinations of optimised, shared, debug libraries. It requires familiarity with external software, coordination and collection of consistent subsystem/project developers tags. The complexity of the software multiplies by the number of various components, subsystems, and projects that are used in a single system or the system relies on. The installation and validation of the final release.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	Ongoing
Risks/Constraints:	*Describe constraints, assumptions and risks.* Resources look low but I think there is a lot of double counting ???
Resource:	01/01/2001 - 31/12/2007: **0.3** FTE (0.0 available). CMS librarian.

Deliverable:	**4.2-b Automatic test procedure (using examples) for new releases**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2003: **0.1** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2004 - 31/12/2007: **0.3** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.2-c Release distribution and installation tools**
Description:	Provide tools to facilitate the distribution and installation of CMS software. This includes aspects of software configuration, configuration verification as well as exporting the software to tier 1/2/3... centres.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.* Resolve overlaps with process infrstructure, SCRAM, etc.
Resource:	01/01/2001 - 31/12/2002: **0.1** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2004: **0.3** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2005 - 31/12/2007: **0.5** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.2-d Nightly builds**
Description:	As a part of the release process the nightly builds with the proper log book keeping, building test programs and run them to detect critical points as soon as possible.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	The developers of the CMS software would be obliged to provide those tests for their code.
Resource:	01/01/2003 - 31/12/2003: **0.5** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2004 - 31/12/2007: **0.2** FTE (0.0 available). Toolsmith/engineer.

4.3 External Software Support

This task covers the support associated to the use of non-CMS (HEP, public-domain, and commercial) software in the CMS environment. Examples of such software include: database software; graphics packages; documentation systems; design and code management tools; parsers; GUI builders; and so on.

Deliverable:	**4.3-a Infrastructure to support non-CMS software**
Description:	This item consists of a coherent Software Infrastructure for handling non-CMS software. It includes a software repository, multi-platform build, release, distribution, and documentation systems, and regular public versioned releases of both software and documentation. All aspects of this infrastructure should exploit common CMS tools and procedures as much as possible. In some cases the build, release and distribution mechanisms of other projects (e.g. CERN/IT) will be used but the configuration information is still required.
Responsible:	*Name of deliverable here.*
Client(s):	*Responsible person*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	The maintenance of this infrastructure requires ongoing effort from qualified personnel.
Resource:	01/01/2001 - 31/12/2007: **0.1** FTE (0.0 available). Toolsmith.

Deliverable:	**4.3-b Verification and Integration of non-CMS software**
Description:	Build non-CMS software obtained as source code on the supported computing platforms and verify its functionality. Integrate self-build and binary imported non-CMS software with CMS specific software and environment.
Responsible:	*Name of deliverable here.*
Client(s):	*Responsible person*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	The maintenance of this infrastructure requires ongoing effort from qualified personnel.
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2005: **0.5** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2006 - 31/12/2007: **0.3** FTE (0.0 available). Toolsmith/engineer.

4.4 Software Performance and Optimisation

Subtask Description here...what it aims to achieve and key functionality... should be easy to check if achieved or not *...type some explanatory text here...*.

Deliverable:	**4.4-a Software profiling system**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2002: **0.1** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2005: **0.5** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2006 - 31/12/2007: **0.3** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.4-b Benchmark definition**
Description:	Define benchmarks for measurements to be taken. This can for example be performance measures done in ”typical” running conditions, or the time it takes to do a concrete software release.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2007: **0.1** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.4-c Benchmark report**
Description:	Perform the benchmark on processes and products at pre-defined check-points, and use normal improvement practices to narrow any performance gap.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2002 - 31/12/2007: **0.1** FTE (0.0 available). Toolsmith/engineer.

4.5 User Support and Training

Provide information on CMS software to Users via a help-desk system and in dedicated training courses. Ensure that the support reflects the actual status of the software. Provide and verify example programs and their documentation.

Deliverable:	**4.5-a Help-desk**
Description:	Provide help material for all aspects of CMS software to the Tier-0/1 centres. This includes lists of responsible persons for particular subjects.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Increase resources for physics TDR.
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Documenter.
Resource:	01/01/2003 - 31/12/2004: **1.0** FTE (0.0 available). Documenter.
Resource:	01/01/2005 - 31/12/2007: **1.5** FTE (0.0 available). Documenter.

Deliverable:	**4.5-b Training**
Description:	Organise and coordinate training courses for all CMS internal software.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2007: **0.4** FTE (0.0 available). Toolsmith/engineer.

Deliverable:	**4.5-c Example Programs**
Description:	Ensure the existence and quality and documentation of example programs for all CMS specific software.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/01/2001 - 31/12/2002: **0.2** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2005: **0.6** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2006 - 31/12/2007: **0.3** FTE (0.0 available). Toolsmith/engineer.

4.6 Documentation

This task includes producing a strategy for identification and maintenance of the documents to be produced during the life-cycle of the software, identification of the standards to be used for the development of the documentation, the identification of all documents to be written in a project or when performing a process, a specification review and eventual approval of the contents and purpose of these documents, the verification that documents are produced and maintained in accordance with the specified standards/templates. Note that this is very multifaceted, and can concern many areas. If documentation is not to diverge, focus must be given by very clearly defining the documents to be produced, with an eye on their maintainability.

Deliverable:	**4.6-a Documentation infrastructure**
Description:	Establish common infrastructure and standard procedures for writing changing and maintaining documentation, including source code, design, or architecture documents.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Documentation policy available.
Resource:	01/01/2002 - 31/12/2002: **0.5** FTE (0.0 available). Toolsmith/engineer.
Resource:	01/01/2003 - 31/12/2007: **1.0** FTE (0.0 available). Toolsmith/engineer.

5 Software Process and Quality *(Johannes Peter Wellisch)*

This is mainly the CCS companion of GPI. The reason for splitting this tasks into two aspects is that core software resources are needed in many aspects, in particular of the infrastructure for process performance. The integration aspects, that are necessary to ensure that we have a running system in the various operational environments were added.

5.1 Measurement, and Quality Assurance

The goal of the measurement process is to collect and analyse data related to the software architecture, design, implementation, testing, but also configuration management, validation, requirement elicitation, etc. in order to help improve the individual processes. It also allows to objectively demonstrate the quality of the software. It includes the definition of an appropriate set of measurements along with the provision or development of suitable tools, and the collection and analysis of the corresponding data. It also includes the distribution of these results to all people involved or interested.

The purpose of Quality Assurance is to provide assurance that the design, software, documentation, and other work products and processes comply with the specified requirements and stick to their established plans. This includes producing implementing and maintaining a strategy for performing the quality assurance activities, and recording evidence of their performance. problems/bugs or non-conformance will be found, and the correct application of any standards, procedures as well as fulfilment of process requirements will be verified objectively. To be unbiased, it is mandatory that quality assurance activity acts independently from the direct responsible for developing the software.

Deliverable:	**5.1-a Quality assurance: Strategy**
Description:	Write and maintain a paper specifying the scope of quality assurance and the responsibilities for quality.
Responsible:	*Responsible person*
Client(s):	CMS
End Date:	once QM in place
Risks/Constraints:	Basic technological decisions have been taken.
Resource:	01/01/2001 - 31/06/2001: **0.2** FTE (0.0 available). quality manager.

Deliverable:	**5.1-b Quality assurance: standards**
Description:	Establish and maintain a set of standard quality criteria for the relevant processes and work products. Establish for each item in the quality standard fit-criteria. This includes style and coding rules, test coverage in the various operational environments; procedures for migrating code to the trigger environment, software complexity measures, packaging rules, etc..
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Needs the policy statement. Cannot start, no resources.
Resource:	01/01/2002 - 31/12/2007: **0.1** FTE (0.1 available). Process manager.

Deliverable:	**5.1-c Quality assurance: record**
Description:	Perform a set of tests that establish at the needed level of confidence that the processes and work-products (software, designs, documentation, etc.) are according to the agreed-on quality standards. This includes checking of the rules described above.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Needs the Quality standards at least in rudimentary form, and infrastructure. Would like to start before but no resources for 2001.
Resource:	01/01/2002 - 31/12/2002: **0.5** FTE (0.0 available). quality assurer.
Resource:	01/01/2003 - 31/12/2007: **1.0** FTE (0.0 available). quality assurer.

Deliverable:	**5.1-d Quality assurance: Closed problem report**
Description:	Report, analyse, correct etc. any problems found, and trace the corresponding actions to closure.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Quality record available. Should start earlier but no resources.
Resource:	01/01/2002 - 31/12/2002: **0.5** FTE (0.0 available). Quality manager.
Resource:	01/01/2003 - 31/12/2007: **1.0** FTE (0.0 available). Quality manager.

Deliverable:	**5.1-e Example Standard: Coding rules and style guidelines**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-f Example infrastructure: Tool for checking style rules**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-g Example infrastructure: Tool for determining CMS and external software dependencies and metrics**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-h Example infrastructure: Tool for analysing and displaying dependency and metric data**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-i Example infrastructure: Tool for test coverage analysis.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-j Example infrastructure: Tool for checking coding rules**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-k Metrics analysis paper**
Description:	Establish measurable quantities for process and product measurement and make sure data can be and are collected and analysed against the metrics. An example would be essential cyclic complexity for code quality, number of pre-releases during release sequence for code organisation, or the result of path coverage analysis for testing.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	Stalled due to loss of manpower
Risks/Constraints:	*Describe constraints, assumptions and risks.*
Resource:	01/06/2001 - 31/12/2007: **0.3** FTE (0.0 available). quality engineer.

Deliverable:	**5.1-l Change control procedure and tools**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-m Measurement record**
Description:	Do the measurement on a base-lined work-product or process, and the above described metrics, benchmarks or statistical data. For example coding rule analysis of source code, using our rules standard, or a dependency diagram of released code. Make the measurement data available for decisions where it is relevant.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.1-n Benchmark definition**
Description:	Define benchmarks for measurements to be taken. This can for example be performance measures done in "typical" running conditions, or the time it takes to do a concrete software release.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

5.2 Software Re-use

The purpose is to promote and ease the use of new and/or existing software from both the people and the product perspective. This includes the definition of re-use strategies, and identification of activities and infrastructure needed to facilitate and perform re-use, as well as their establishment and maintenance. This task in strongly coupled with configuration management and system integration.

Deliverable:	**5.2-a Re-use strategy**
Description:	Identify, develop and apply re-usable entities at all organisational levels, with the goal to improve productivity and quality.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-b Re-use libraries: CMSToolBox**
Description:	Establish a re-use library for collection, categorisation, management, update, etc. of re-usable entities.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-c Re-use planning**
Description:	Identify and document reusable entities such as code modules, tests, interfaces, components, documents, infrastructure, processes, etc...
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-d Re-usable item**
Description:	Design and develop re-usable entities, and keep them stable and consistent. Maintain consistency stability and standardisation of re-usable entities in the re-use library (like magnetic field between simulation and reconstruction).
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-e Information session**
Description:	Inform potential users about the existence of re-usable entities, including features and possible restrictions or problematic areas.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-f Re-use example: Database access utilities**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-g Re-use example: Magnetic field**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-h Re-use example: Filters and selectors.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-i Re-use example: Generator interface and particle classes.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**5.2-j Re-use example: Configuration management infrastructure.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

5.3 System Integration

This item covers the development of a system integration test strategy for integrating system units consistent with the release strategy, and for testing the system in the different operational environments. It includes the development of a strategy to re-test (regression testing) system aggregates, in case of a change in a component of the system, and identifying aggregates of system units and a sequence and order in which to test them. This will be done consistent with the system architecture and release strategy. It includes the development of tests for the identified system aggregates, that ensure that the given part of the system satisfies requirements, running the tests, and the documentation of the test results. Each test to be run for a system aggregate will be described, indicating the requirements being checked, input data, system components needed to perform the test, and validation criteria.

Deliverable:	**5.3-a System integration test strategy**
Description:	Develop the strategy for integrating system units and for testing the system. This shall be done consistent with the release strategy.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Assumes that release strategy and system architecture are available.

Deliverable:	**5.3-b System regression test strategy**
Description:	Develop a strategy for re-testing the system or parts of it, should a change be made.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	System integration test strategy available.

Deliverable:	**5.3-c List of system partitions**
Description:	Build a list of aggregates of system units that can be separately tested. Identify the aggregates, and define a sequence in which to test them.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	System integration test strategy, release strategy and system architecture available.

Deliverable:	**5.3-d Tests for system partitions**
Description:	Describe the tests to be run against each partition of the system. Include the requirements to be checked, input data, fit criteria, and a list of system components and supporting infrastructure needed for the tests.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	List of system partitions available.

Deliverable:	**5.3-e Tested system partitions**
Description:	Test each individual system partition and make sure that it satisfies the specified fit criteria. Write up and storage of the results is mandatory.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Tests for system partitions available.

Deliverable:	**5.3-f System tests**
Description:	Develop and describe the tests to be run on the integrated system. Specify use-cases and/or requirements checked, input data and fit criteria.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	system architecture is available.

Deliverable:	**5.3-g Integration Testing**
Description:	Integrate the system, and perform above tests on the integrated system. Make sure eventual faults are corrected, and document all results, including fault history.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Tested system partitions and system tests available. The resources below refer to this block of deliverables.
Resource:	01/01/2002 - 31/12/2002: **1.0** FTE (0.0 available). System integrators.
Resource:	01/01/2003 - 31/12/2004: **1.5** FTE (0.0 available). System integrators.
Resource:	01/01/2005 - 31/12/2007: **2.0** FTE (0.0 available). System integrators.

6 Production Processing and Data Management *(Tony Wildish)*

6.1 Production Tools

Delivery and maintainance of the tools required to manage site-specific and worldwide simulation and reconstruction productions.

Production management and data management is not a project that can easily be handled in terms of prototypes. Since we don't yet know what the final system will look like, and are unlikely to know for some years, a more appropriate approach is an evolutionary toolbox. We shall attempt to identify the tools that are needed and implement them in as flexible a manner as possible, so that they can evolve with our understanding of the problem.
Given the wide variety of farm environments, and the fact that we cannot be certain that we know what a farm will look like in a few years time, it is more appropriate to attempt to concentrate on the core task of running the production and to add new tools to the production toolbox as and when we understand what we need. It is essential that the implementation of these tools be flexible enough that the evolution of one tool does not break another.
A further consideration is that many regional centres are coming online now, and they need tools to be able to commission their regional centres. Every piece of functionality that we can provide represents a piece that they do not have to re-invent for themselves. If we do not invest the effort now, the regional centres will waste time inventing something which works for them, and they will be reluctant to give it up when we finally produce tools. Ergo it is important to deliver some (probably minimal) functionality as as soon as possible, and evolve towards a better product, rather than adopt a long design phase.
This inevitably means that the T1s and eventually the T2s will take on a significant fraction of the development work themselves, as they each solve their own unique problems. They should advertise the tools they produce and be prepared to invest effort to allow them to be used in other centres. This in turn means that the tools will have to evolve via collaboration, rather than being developed in isolation and delivered to the community.
It is assumed that initial implementations of most of these tools will be command-line based, and that GUI versions will only be built if the tools are to be used eventually by less expert people or if the amount of data (output) they generate suggests some form of browser is appropriate. The effort of building a GUI on top of a tool should not be underestimated! In any case, the command-line version will normally be needed for automated operations.
Many tools already exist in some rudimentary form. It is important to consolidate these to try to control divergence when different regional centres need something slightly different to what already exists. At the same time, development of these tools into something more sophisticated is not always urgent. For example, developing a GUI on top of an existing tool may be delayed if only a few people need the tool, but becomes more important once several people need it, especially if they are not experts in the corresponding field. Tools may therefore have two (or more) decoupled development cycles (prototype and polished versions) which may be separated by a long period of maintenance, depending on the people who need it and the complexity of the environment it operates in.
A further assumption is that T1 and T2 centres will use productions as a means of commissioning themselves and bringing their facilities and staff up to speed. Even if they are to be used primarily for analysis, running productions is a good way to benchmark their performance. This means that at least the basic functionality to do this must be in place when they come online.
In the development of initial functional tools it is imperative that a suitably representative number of centres take an observational role at least, in order to ensure that the tool will do what they need. If we build a tool that only works at 2 T1s and then have to re-write it for the other 3 we are wasting time. Therefore the T1s should be prepared to commit some fraction of a person to watching and contributing to the design of the tools, if not to their implementation. This fraction of a person is not accounted here because it is impossible to say how much of a person at each T1 should care about each tool, but it is unlikely to be less than 0.1 person constantly.

Deliverable:	**6.1-a Documentation of the production process**
Description:	A (set of) document(s) will be produced describing the required steps of a production. I.e. the steps that must be completed in order to produce a dataset, to validate it, and to export it. The documentation will describe which configuration items are to be stored, to ensure that all produced data has a complete audit trail. The documentation will also describe the necessary manipulations to perform on production data, and will describe the tools that perform these manipulations. This documentation will be the baseline introduction for new centres/personnel that wish to run productions, and allows centres to contribute usefully by following correct procedure even before all the tools are available. This document will evolve with the production process itself.
Responsible:	*Responsible person*
Client(s):	This is needed by all new Tier-n production staff, as well as by the people responsible for defining and reviewing the production chain.
End Date:	First complete version by June 2001
Risks/Constraints:	
Resource:	01/04/2001 - 30/06/2001: **1.0** FTE (0.0 available). Documentation.
Resource:	01/07/2001 - 31/12/2007: **0.2** FTE (0.0 available). Documentation.

Deliverable:	**6.1-b Tools for production job specification**
Description:	Document a format for complete specification of production processing jobs. In addition, where Monte Carlo generation is involved, the specifications should include the physics process. The implementation should support the ability to store and to easily switch between different sets of parameter definitions or data cards meaningful to distinct physics groups. The implementation should support a flexible interface for user input of parameter sets a few at a time and for automatic import of many parameter sets with versioning control. The other CMS production processing tools described here will be required to support this format. We must therefore take great care in defining the format in such a way so that it is easily extensible without breaking coexisting tools. Specification will also depend upon a reasonable definition of runtime environment since things like ORCA version will likely be included as part of the processing specification.
Responsible:	Greg Graham
Client(s):	Production operation staff need to know how to feed parameters from physicists to batch jobs.
End Date:	Before the end of 2001
Risks/Constraints:	
Resource:	01/03/2001 - 31/12/2001: **0.5** FTE (0.5 available). Engineer/Toolsmith.
Resource:	01/02/2002 - 31/12/2007: **0.3** FTE (0.3 available). Engineer/Toolsmith.

Deliverable:	**6.1-c Tools for production job generation**
Description:	Tools for production job generation should include facilities for converting production job specifications into executable scripts. The target scripts should support some facility for recording and reporting exit status on successful completion or failure. The format of the target scripts will be something like Hans Wenzel's scripts with added routines to generate job tracking information. Also general purpose hooks should be included at various stages to external tools, e.g.- validation, staging, and recovery. The tools should eventually include a high level interface for the production operations coordinator which assume that that person is not an expert, and which minimises human interaction with the tools. Due to variations in local processing architectures, the actual scripts generated from the specifications may vary from site to site; but the results for a particular job specification are required to be the same. This assumes that all sites have a well defined and common runtime environment for CMS executables and quality control procedures to ensure consistency of result. The tools will have to evolve in the light of conclusions from the job specification task.
Responsible:	Greg Graham
Client(s):	Production operations staff at the regional centres.
End Date:	Prototype by may 2001, complete suite by end of 2001.
Risks/Constraints:	Regional centres will need to provide 0.5 FTE for 2 months per site to commission these tools locally and deliver feedback to the maintainer to ensure they evolve correctly.
Resource:	01/03/2001 - 31/12/2001: **0.4** FTE (0.4 available). Engineer/Toolsmith.
Resource:	01/01/2002 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-d Tools for high level tracking of production jobs**
Description:	Specify what needs to be tracked at the production centres and how it should be integrated at central sites (be they T0 or a T1). This basically amounts to bookkeeping for the dataset, and it should be easily browsable. It is at this level that we will declare that production of a dataset has been completed. Tools for high level tracking of production jobs should provide facilities for keeping track of production job requests and statuses. The tools should make it easy for the production operations coordinator to discover the global state of progress of production and to identify problem areas quickly and focus attention there. The tools should assume that the production operations coordinator is not an expert. In particular, the production operations coordinator should be able to easily and quickly find out what has been requested, what is the overall status of the request, and any necessary information needed to give an expert in case a problem has arisen. The tools should also include facilities for generating tracking information at the remote processing sites automatically and for integrating that information automatically at other locations. The High Level Tracking Tools may depend upon the more low level tracking tools at remote processing sites to provide basic information. These tools also depend on the hooks to be placed in the actual production scripts. However, where regional centres choose to opt out and provide tracking information in their own way, they are required to provide that information in a compatible manner.
Responsible:	*Responsible person*
Client(s):	Production operations staff and PRS groups who request productions
End Date:	First usable version by end of 2001
Risks/Constraints:	
Resource:	01/06/2001 - 30/06/2002: **0.4** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/07/2002 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-e Tools for low level tracking and control of production jobs**
Description:	It should be possible to stop/start/pause/resume jobs in a clean and controlled manner. It should be possible to do this automatically in the event that problems occur (e.g. with disks filling up). It should also be possible to resume the work that a production job was performing from the point where it was stopped. This is the level where we determine that a given job has failed 4 times in a row because of pathological data, for example. In practise some part of these tools may have to be written by each centre if the farms are all radically different (e.g. the 'job harness'). It may not be possible to write a generic tool, but it should be possible to define a generic interface for the tools so they can fit into a framework. There may be requirements for architectural changes to support these tools, e.g. to the meta-data, to the threading-model etc.
Responsible:	*Responsible person*
Client(s):	Production operations staff
End Date:	First usable version by end of 2001
Risks/Constraints:	
Resource:	01/03/2001 - 30/06/2002: **0.4** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/07/2003 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-f Tools for job-level validation of results**
Description:	Tools for validating the results of batch jobs, including programs for checking both output files and database integrity where applicable. It is at this level that we detect that a job ran, but must be re-run for whatever reason (e.g. tape errors or loss of access to servers). This refers only to validation of the completion of the batch job itself, not physics-level validation of the contents of the events. That has to come from the PRS groups, though it may eventually be supported as an extra step in the production chain to allow it to be automated. Even if the process is automated, it will still be the PRS responsibility to ensure that the results are acceptable. Validation programs should run automatically from hooks in the processing scripts where practical and validation results should be part of the high level tracking specification. Among the output of the validation are the luminosity associated information in generation jobs and the number of events when files are produced and database integrity when using the database. The validation scheme should be flexible enough to add more validation tools later as they become available and perhaps some verification tools as well. The results of this validation must be made available with the high-level tracking results, so that datasets can be determined to be run to completion and also to contain the correct numbers of events, and ultimately to have been correctly delivered to the user via the federation.
Responsible:	*Responsible person*
Client(s):	Production operations staff and physicists taking first-look at the data
End Date:	First version before Christmas 2001
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2002: **0.4** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-g Tools for error discovery and recovery**
Description:	When a batch job fails for whatever reason it must be possible to deduce how much work was actually achieved, and this without access to the job log files. This should be capable of acting on the output of one job or on an entire dataset. This task will be responsible for re-generating job scripts to be resubmitted to finish a production, and for the tools to clean up a farm after a bad crash. It should be possible to determine the results of each job from the database or FZ files alone, and to correlate this with what was originally requested. This should include a tool to roll back a production job to some logical point (e.g. the beginning, or a transaction boundary) and a tool to fix corruptions in the database as much as possible (e.g. cleaning meta-data to allow the elimination of broken datasets which may then be generated afresh. Responsibility for reporting failures lies with the production scripts and tracking tasks. This is highly correlated with several other tasks in that specific recovery procedures may depend upon specific production procedures and on the nature of the executables themselves. It is required that errors be detected as early as possible to minimise waste of resources. As specific failure modes are discovered, the need for more specialised recovery tools may become apparent.
Responsible:	*Responsible person*
Client(s):	Production operations staff.
End Date:	First version by end of 2001
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2001: **0.8** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2002 - 31/12/2007: **0.6** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-h Tools for monitoring of production resources**
Description:	This refers to the farm-level operation monitoring that ensures the integrity of the farm and generates statistical information such as total network throughput, disk usage, CPU usage etc. It also includes CMS production-specific parameters such as Objectivity lock-server and AMS server statistics, statistics on the efficiency of individual batch nodes and batch jobs, everything. This allows technical staff to make sure the farm isn't dying, aids production staff in estimating the time to complete productions, and helps management to draw up meaningful estimates of upgrade paths etc. The monitoring tool must include an interface for automatic tools that can make use of this information - e.g. to decide where to send jobs or to drive MONARC simulations, or tools that take action to prevent a failure when they detect a disk filling up etc. This has overlap with Grid functionality. In one sense, the monitoring tools should provide input to the Grid which will decide where jobs go. In another sense, the monitoring outputs are generated by Grid tools.
Responsible:	*Responsible person*
Client(s):	Production operations staff, production coordinator, site sys admin.
End Date:	First usable version before Autumn 2001
Risks/Constraints:	RC's should expect to invest 0.2 FTE for 4 months per site to tailor the monitoring to their farms.
Resource:	01/03/2001 - 31/12/2001: **0.8** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2002 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.1-i Tools for automatically reconfiguring farm parameters**
Description:	This means a set of tools that use the up-to-date monitoring information to decide to intervene in farm operations to improve the total farm efficiency. E.g, manipulating an RRP table automatically to load-balance across servers, reduce the job submission rate or temporarily suspend jobs when a server becomes overloaded, alter job/process priorities to encourage some tasks to finish faster than others for whatever reason.
Responsible:	
Client(s):	Production operations staff.
End Date:	Not needed 'in production' before 2005
Risks/Constraints:	
Resource:	01/06/2002 - 31/12/2005: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2006 - 31/12/2007: **1.0** FTE (0.0 available). Engineer/Toolsmith.

6.2 Production Operations

Operations of worldwide simulation and reconstruction productions.

Deliverable:	**6.2-a Tools for the definition of samples to be produced through liaison with PRS**
Description:	Initially a web-interface where PRS groups or individuals can request production of a given dataset, specifying parameters like the ORCA version, the pileup conditions, which set of cards to use. Eventually this task will use the specification formats defined in the production tools subtask, automatically putting the specific parameters sets and data cards from the physics groups under configuration management, and making them available for the high-level production tracking task and the error-discovery and recovery tasks to interrogate during the course of validating a dataset.
Responsible:	*Responsible person*
Client(s):	PRS groups need this to be able to request productions
End Date:	Final system by end 2002
Risks/Constraints:	Depends on the format specification defined in the production tools, so should start after we have a first definition of that. We also need input from the PRS on what they need to specify and how they want to do it.
Resource:	01/06/2001 - 31/12/2002: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.2-b Coordination, priorities, distribution (parameters, tasks, ...)**
Description:	Someone to coordinate the scheduling activities of the production. This means deciding which of the requested samples should be produced when, co-operating with the PRS to understand the constraints and parameters that are imposed on each sample, and preparation of the runtime environment to implement the production of that sample. This person also needs to ensure that the PRS perform the physics/event-level validation of the samples in a timely manner. This person also needs to ensure that RC's offering production facilities follow the procedures to ensure that the data is correct, and is responsible for identifying features that are needed in the high level tools that are implemented in other tasks. These people should probably not be writing tools themselves, but will request engineers to do so.
Responsible:	*Responsible person*
Client(s):	PRS groups and production manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/04/2001 - 31/12/2004: **1.0** FTE (0.0 available). Manager.
Resource:	01/01/2005 - 31/12/2007: **1.5** FTE (0.0 available). Manager.

Deliverable:	**6.2-c Production operations staff**
Description:	Someone to coordinate the day to day activities of the production at the T0, T1, and T2 sites. This means checking that the data is being produced/validated/exported, and ensuring that the production is running efficiently. There may be one such person per RC, or perhaps one person covering several Tier-2 centres. This is essentially a system administration task and is not necessarily performed by a physicist or even a member of CMS.
Responsible:	*Responsible person*
Client(s):	Production coordinator needs someone to liaise with at the regional centres.
End Date:	Per T1, as it comes online. Per T2 such a person may be needed during commissioning, and may then devolve to T1 staff.
Risks/Constraints:	1 FTE per T1 constantly. May actually be slightly less than a whole person eventually. This person is not CCS staff, so is not accounted for here, however if they are not in place then we cannot use the T1/2 properly. At the T0, this responsibility may be significantly absorbed by IT division, reducing the need for an extra body.

Deliverable:	**6.2-d Validated Samples of Events**
Description:	The PRS groups, using the high-level tools, will request a dataset to be produced. The production coordinator will negotiate with them to determine the priority and resources available for this sample, and ensure that the sample is produced. This includes accounting for the production, shipping, and storage of the data.
Responsible:	*Responsible person*
Client(s):	PRS groups
End Date:	continuously...
Risks/Constraints:	This is not a deliverable in the sense that it is a continual delivery of datasets that is needed, it is not easy to assign a date to it. Nonetheless, datasets are clearly real things that can be identified and delivered! Perhaps it makes more sense here to think in terms of the validation information and delivery time associated with datasets, rather than the datasets themselves?

6.3 Integration of Production Tools and Grid Services

Deliver GRID tools and infrastructure to allow efficient use of the CMS worldwide resources. Collaborate with recognised GRID projects to specify and test GRID tool and applications.

Wherever possible tools developed by the recognised grid projects (PPDG, GriPhyN, and DataGrid) will be exploited to avoid duplicating effort.

It is assumed that the CMS grid activities are primarily integration tasks, and that at least half of the effort of integration will come from the grid itself as the provider of the code. This is comparable with the model of a regional centre producing a tool and then supporting the effort to port it to other centres, as mentioned earlier. However, where the timescales of the grid are too long to meet our immediate needs, judicious prototyping may be used. This will allow us to feed back requirements into the grid, which will help ensure that it delivers what we need.

Deliverable:	**6.3-a Grid integration**
Description:	As and when the grid starts to appear we will need to adapt the tools in our tool-box to make use of its facilities, and to adapt/extend our farms to provide the services that the grid tools will need.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	Starting next year
Risks/Constraints:	Assume that at least half of the manpower will come from the grid, so only account for half of what we need here, as stated above. The profile here is driven by the desire to feed input into the grid for some time to make sure that it delivers the things that we really need, and then to reap the benefits of the results. We cannot simply wait for the grid to deliver and then expect to use its tools out of the box, hence the early investment of a significant chunk of manpower. In fact, the grid is one of our most significant risks, in that if it is built it will solve a lot of our problems, but if it is not what we need then we will have to develop the solution to the problems ourselves. Furthermore, we can expect to lose CMS manpower to the grid. Many sites can obtain funding for grid work and then have to commit the manpower to do that work. Even if CMS are eventually able to use the resulting products, the timescale for delivery may be too long, meaning that CMS has to provide some sort of solution in the meantime. This is already happening, we are losing manpower in the Universities and regional centres, and also we are losing some from IT division at CERN. The argument that ‘we are solving the problem for everybody, not just CMS’ is persuasive, but dangerous!
Resource:	01/01/2002 - 31/12/2007: **1.0** FTE (0.0 available). Integrator/interfacer.

6.4 Database Management Tools

This item covers generic issues pertaining to the use of an ODBMS for the storage of CMS non-event and event data, including those associated to the operation of a database federation in a heterogeneous distributed environment. In addition, a construction database has been developed and deployed as part of the CRISTAL project.

Objects are stored persistently, reusing as much as possible of what provided by the ODBMS itself to store, organise and retrieve data, and to administrate both data and meta-data including schema declaration, schema evolution, object versioning and database replication. Optimisation mechanisms such as caching, compression, and physical clustering of objects will be implemented such that they are transparent to the user. A large fraction of the ODBMS activities are carried out in the context of the CRISTAL, GIOD, MONARC, RD45, and WISDOM projects.

Deliverable:	**6.4-a Publish catalogs and contents (local and WAN) and check coherence**
Description:	Remote centres must be able to determine the existence and extent of completed datasets produced locally. From this information it must be possible for a remote centre to somehow gain access to that dataset, either by WAN-based direct access to the database or by bulk replication of all or part of the dataset. Remote centres must be able to determine the exact nature of the datasets that are published in conjunction with the bookkeeping information from the production of that dataset. Assume that this will be web-searchable and indexable so that users can discover the location of '10k events with single electrons and no pileup' without having to know who produced them.
Responsible:	*Responsible person*
Client(s):	Production staff responsible for exporting data, PRS members wanting to analyse a dataset, and Tier-n managers wanting to replicate data locally
End Date:	First usable version by end of 2001, definitely need something GUI-based for non-experts by, probably, beginning of 2005.
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2002: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.4-b Tools for integrating results from distributed productions**
Description:	Data produced remotely and imported to a centre must be integrated into local federations in a manner that is transparent to the users. There should be no risk that jobs crash because of the state of the integration.
Responsible:	*Responsible person*
Client(s):	Local DB administrators.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Data-import may take place over an extended interval, so we cannot assume it is atomic. At all times, the users must have a coherent picture of what is available, even if that picture is not (yet) complete.
Resource:	01/06/2001 - 31/12/2002: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.4-c Tools for resource allocation (disk, server etc)**
Description:	This is related to farm complexity, and should be prototyped at the T0. Hardware resources (disk/CPU/network) may be allocated to production farms and/or to users analysing data. It must be possible to partition the allocation in any centre in such a way that the users do not interfere with the production and vice versa. It must also be possible to allocate or remove resources dynamically, with no interruption of access to the data that is being served. Such reallocation may happen automatically in a load-balancing system. Users with private federations (shallow copies) must also see the changes in resources, not just the 'official' federations. This is essentially the manual-labour version of the 'Tools for automatically reconfiguring farm parameters' task, and should form the basic toolkit for that task. This ability to (re-)allocate resources also forms the basis of a high-availability system, and is therefore extremely important in systems such as we will finally build.
Responsible:	*Responsible person*
Client(s):	DBA and sys admin staff, as well as farm-operations staff.
End Date:	*when?*
Risks/Constraints:	That a networking expert is needed may not be obvious. However, to first approximation this task will result in switching nodes into/out of farms, and in failing-over failed servers. Also, the detection of problems is more likely to be based on network performance than other parameters.
Resource:	01/06/2001 - 31/12/2004: **0.6** FTE (0.0 available). Networking expert.
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.0 available). Networking expert.

Deliverable:	**6.4-d Tools for optimising performance**
Description:	Based on information about the access patterns of the users and the performance of the hardware, tools will be needed to allocate resources to ensure high performance. This should include the possibility to allow users to give hints ('I will run on this dataset 24 times per day for the next week' or 'I want (all/only part of) that dataset') so that database files can be pre-staged or 'pinned' on disk intelligently. At a lower level, tools are needed for simple re-clustering of data on disk or on tape and for deciding which files are served by which servers. Probably re-clustering on tape is the most important idea to pursue.
Responsible:	*Responsible person*
Client(s):	DBA
End Date:	Later rather than sooner
Risks/Constraints:	There is a tradeoff here between trying to optimise what you have and simply buying more hardware. Hence the apparently low manpower investment in the early stages. Later, as we approach the full level of complexity and the beginning of real data-taking, optimisation will become much more important. We may be able to optimise a T2 by buying more hardware, but doing so at a T1 may not be an option. This is reflected in the profile, a modest effort early on followed by significant before before the T1s ramp up fully (so there is still time to influence their decisions).
Resource:	01/06/2002 - 30/06/2004: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/07/2004 - 31/12/2007: **1.0** FTE (0.0 available). Engineer/Toolsmith.

Deliverable:	**6.4-e Tools for facilitating common DB administration tasks**
Description:	Creation of new databases, shallow and deep copies, attaching/removing individual database files and entire datasets, validating and invalidating parts of datasets, relocation of files, monitoring of locks, automatic cleaning of stale locks, applying access-constraints (read-write/read-only etc), declaring database files as definitively closed etc.
Responsible:	*Responsible person*
Client(s):	DBA
End Date:	Some basic tools are needed urgently, others can wait.
Risks/Constraints:	Further tools will have to be written as the need for them becomes known. I assume that as we approach first data there will be a greater need for more tools.
Resource:	01/06/2001 - 31/12/2005: **0.5** FTE (0.0 available). DB administrator.
Resource:	01/01/2006 - 31/12/2007: **1.0** FTE (0.0 available). DB administrator.

Deliverable:	**6.4-f Tools for facilitating user-level DB administration tasks**
Description:	Similar to the previous task, this amounts to basically taking the same tools that are created for that task and making them fool-proof, user-friendly, and semi-intelligent so that users can perform the basic tasks they need to manipulate the contents of their own federations. This probably means adding a web-based GUI for many of the tools.
Responsible:	*Responsible person*
Client(s):	The dreaded End User
End Date:	Starting next year
Risks/Constraints:	*Check overlap with IGUANA section*
Resource:	01/01/2002 - 31/12/2004: **0.3** FTE (0.0 available). Engineer/GUI designer.
Resource:	01/01/2005 - 31/12/2007: **0.5** FTE (0.0 available). Engineer/GUI designer.

Deliverable:	**6.4-g Tools for making DB sanity checks, fixing corrupt DB's,...**
Description:	Tools are needed for checking the integrity of a database at the level of the database file, the DB structure and at the level of the CMS event model. It must be possible to cleanly remove corrupted events or parts of events from a dataset. It must be possible also to restore such removed items if the problem can be resolved later (e.g. restore from backup etc). The tools must be capable of making some level of sanity checks with only the meta-data, to avoid massive data-movement. I assume this is mostly a problem when importing new data from other RC's, or when disks or tapes start to die and corrupt files. As far as possible all surgery should be performed on meta-data alone, to avoid having to re-write stable data. For productions we can live with larger-scale surgery, such as the ability to delete runs. When we finally start to take data we will need much more finesse.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	Not needed before end of 2005
Risks/Constraints:	
Resource:	01/01/2003 - 31/12/2005: **0.5** FTE (0.0 available). Engineer/Toolsmith.
Resource:	01/01/2006 - 31/12/2007: **1.0** FTE (0.0 available). Engineer/Toolsmith.

Part II

TriDAS Online Software

7 Online Filter Software Framework *(Emilio Meschi)*

The aim is to design and develop a complete software infrastructure for the online high level triggers. The task breakdown highlights the interactions of the online filter software with external entities. To meet the functional requirements of the CMS filter farm a number of small R&D projects will be needed. At the end of the R&D part, development of production level support software for the various functionalities of the filter nodes will start.

The Filter Framework interacts with DAQ-type environments and Offline-type environments, it is a distributed system and it is an information server (e.g. when it provides monitorable physics data). The “glue” between various services and interfaces, task coordination and prioritisation, and information services will have to be designed and developed to build an online filtering application. Deployment of a fully functional (set of) product(s) is mandatory around two years prior to the beginning of data taking.

Deliverable:	**7.0-h Online Filter Software Management**
Description:	Management of design and development of software specific to the Online farm (interfaces, services, controls and monitoring). Maintenance of the final products will have to provided when experiment starts.
Responsible:	*Responsible person*
Client(s):	TriDAS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	
Resource:	01/01/2001 - 31/05/2005: **0.2** FTE (0.2 available). EFF Manager.
Resource:	01/06/2005 - 31/12/2007: **0.5** FTE (0.5 available). EFF Manager.
Resource:	01/06/2005 - 31/12/2007: **2.0** FTE (0.0 available). Code Manager.

7.1 Input Data Handling

Event data built in the CMS event builder will be delivered to computational units in the Filter Farm via a network interconnect. The delivery must be reliable and the interconnect must be able to cope with the corresponding data traffic. The aim of this task is to evaluate the implications of such a data flow, define the relevant interfaces and the raw data format. This is necessary for development both on the EVB and the Filter Farm side to proceed. Tools to test prototype software will be necessary for the rest of the project to proceed.

Deliverable:	**7.1-a Data access interface and EFF-DAQ interconnect**
Description:	Define data access interfaces to the DAQ data source (Builder Unit). Assess impact of various transport protocols as a function of the interconnect capabilities. Evaluate technologies for DAQ/Filter Farm interconnects. Specify performance and impact. Design baseline and upgrade solutions in conjunction with the TriDAS Event Building designers.
Responsible:	*Responsible person*
Client(s):	TriDAS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	
Resource:	01/01/2001 - 31/12/2004: **0.5** FTE (0.2 available). Designer-0.

Deliverable:	**7.1-b Raw data formats**
Description:	Coordinate decisions about, and reach a common agreement on, format or raw data from the various detectors. Assess impact of various solutions. Define, document, and track changes in the detector raw data format.
Responsible:	*Responsible person*
Client(s):	TriDAS/Detector groups
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2003: **0.1** FTE (0.0 available). Det-Liaison.
Resource:	01/01/2006 - 31/12/2007: **0.3** FTE (0.0 available). Det-Liaison.

Deliverable:	**7.1-c Data Playback**
Description:	Support for playback of simulated and real raw data through the DAQ/EF. Tools to mimic raw data format from simulated data. Tools to inject data at various levels in the DAQ chain must be developed.
Responsible:	*Responsible person*
Client(s):	EFF software developers, TriDAS DAQ developers
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2003: **0.3** FTE (0.0 available). Designer-0.
Resource:	01/01/2006 - 31/12/2007: **0.2** FTE (0.0 available). Designer-0.

7.2 Output Data Handling

The Filter Farm will output event data at a rate of O(100) Hz. This corresponds to a data throughput of O(100) MB/s. The output data will consist mainly of raw event data from the detector, with the addition of a limited amount of reconstruction information from the High Level Trigger. It is necessary to insure the safeness of this data and minimise the amount of data losses prior to the central mass storage. The impact of object-based storage at an early stage must be assessed as opposed to subsequent preprocessing of raw data into objects. The ability to create privileged data paths for "golden" event data must be provided.

Deliverable:	**7.2-a Local data storage**
Description:	Assess need, devise strategy, and provide software support for intermediate (local) data storage
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2007: **0.2** FTE (0.0 available). Storage Designer 1.

Deliverable:	**7.2-b Interface to CS and DB**
Description:	Produce requirements and design of the Filter application interface to CS. Devise strategy for handling of "remote" mass storage (DB's)
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.5** FTE (0.0 available). Storage Designer 1.

Deliverable:	**7.2-c "Express-line" Interface**
Description:	Provide software support for "express-line" processing of event data
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.3** FTE (0.0 available). Storage Designer 1.

7.3 Control and Monitoring of filter system

At an early stage in the prototyping phase it is necessary to configure and control medium scale test setups with O(100) CPU's. At the same time development of the general CMS run control will have to be tracked to provide access points and interfaces which conform to the general structure. An adequate scaling of performance to the final system will have to be demonstrated. The computational units in the Filter Farm will be the places where most of the monitoring data (both detector and physics quantities) are produced. A consistent API for the extraction of this data, to allow simple development of "consumer" monitor process will have to be developed.

Deliverable:	**7.3-a Configuration and setup**
Description:	Global strategies for configuration and setup of filter applications in the filter farm must be defined. This includes global configuration strategies both for the framework and the actual reconstruction application. A usable system calls for full configurability and reconfigurability with minimal deadtime, and must comply with general specifications for configuration of the DAQ and detector systems.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2005: **0.5** FTE (0.0 available). Designer-1.

Deliverable:	**7.3-b Interface to Farm Control system**
Description:	Design and implementation of "Box Control" services for the EFF computational units and "Application Control" for filtering applications.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2005: **0.5** FTE (0.0 available). Designer-1.

Deliverable:	**7.3-c Online Reconstruction control**
Description:	Design and develop consistent and homogeneous control software for online reconstruction parameters.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/06/2001 - 31/05/2004: **0.5** FTE (0.0 available). Designer-2.

Deliverable:	**7.3-d Detector/Trigger/Physics monitor**
Description:	Support for monitoring of detector/trigger/physics parameters
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.5** FTE (0.0 available). Designer-2.

7.4 Filtering code specification, validation, and quality control

Based on existing prototype code, a set of guidelines will be produced to satisfy the constraints of an online reconstruction and triggering application. A set of benchmarks is necessary to define these guidelines and as tools for developers (physicists) to evaluate the would-be selection algorithms. In addition, quality assurance tools are needed which can probably be shared with offline production code. Finally, a validation procedure, including a final "burn-in" sequence where an older and a more recent versions of the filtering code coexist in the filter farm, must be defined. The latter assumes appropriate support is being provided in the filter framework.

Deliverable:	**7.4-a Code guidelines and specs**
Description:	In conjunction with the software process group of CCS, produce and maintain coding guidelines and specifications, and related documentation, for online filtering code. In conjunction with PRS groups, follow development and deployment of new algorithms and filtering executables
Responsible:	*Responsible person*
Client(s):	EFF coordinator, Reconstruction code developers, Physicists
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/06/2001 - 31/12/2005: **0.2** FTE (0.2 available). Offline Liaison.
Resource:	01/01/2006 - 31/12/2007: **0.5** FTE (0.2 available). Physics Liaison.

Deliverable:	**7.4-b Performance benchmarks**
Description:	Develop and maintain performance benchmarks for filtering applications/modules
Responsible:	*Responsible person*
Client(s):	Online coordinator, Offline coordinator, EFF manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2006: **0.2** FTE (0.0 available). Toolsmith-1.

Deliverable:	**7.4-c Quality assurance and validation**
Description:	Provide quality assurance and validation tools/procedures for new code. We expect to reuse most of the tools developed for QA&V in the offline context. Online specific tools will be limited. Most of the work will go into adapting and organising QA for online purposes
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2006: **0.2** FTE (0.0 available). Toolsmith-1.

7.5 Run condition and calibration tracking

During data taking, the filter applications will have to track changes in run conditions and calibration constants at runtime. Updating this information for the whole farm must cause little or no deadtime and always leave the farm in a consistent state. It must always be possible to reproduce a posteriori the conditions in which the online filtering was running for a certain (set of) events. Specifications on how, how often and through which services these informations are accessed must be produced, and the relative toolkits or API's designed and developed.

Deliverable:	**7.5-a RC&C handling**
Description:	Produce specifications of the access methods, handling and tracking changes of calibration constants and run conditions in the filter application
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2005: **0.1** FTE (0.1 available). RC&C Liaison.

Deliverable:	**7.5-b Run Conditions toolkit/API**
Description:	Design and development of an API or Toolkit for access to Run Conditions in the Filter Application.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.3** FTE (0.0 available). Designer-0.

Deliverable:	**7.5-c Calibrations toolkit/API**
Description:	Design and development of an API or Toolkit for access to Calibration constants in the Filter Application.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.3** FTE (0.0 available). Designer-0.

8 Online Farm(s) *(Coordinator name)*

The Online Filter Farm is responsible of the final selection of event data that is stored permanently. It is a critical item in the data acquisition chain and the first element to perform an analysis of event data. Strategies to assure its functionality with as little as possible deadtime must be ready well in advance. The system management and administration need to be coordinated, a number of knowledge bases need to be maintained on the status of resources (both hardware and software). To minimise down-time, tools to monitor, control, configure and reconfigure a large farm of computers will be crucial. A large fraction of the tools, deliverables, management and operation needs in this area are shared with the GRID project and offline computing centre at CERN.

8.1 On-site Online Farm

The current baseline design of the CMS data acquisition calls for local filtering of event data from the event building stage, in a farm of computers located on site. This farm will have the largest computational power compatible with cost, space and power constraints. System administration for a cluster of several thousands of CPUs must be insured with minimum down-times. The farm will produce a large amount of data to be stored in the central mass storage facilities of the CERN T0/T1. An appropriate network bandwidth must be insured among the experiment site and the CERN computing centre

Deliverable:	**8.1-a Computing resources**
Description:	Provide the computational power needed to process CMS data and perform the data reduction necessary to achieve a required sustainable output rate.
Responsible:	*Responsible person*
Client(s):	*Who wants it*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Must be available on schedule for the experiment to start. Computing resources (hardware).

Deliverable:	**8.1-b Filter Farm to DAQ networking**
Description:	Provide the network connectivity between the event builder and the Filter Farm.
Responsible:	*Responsible person*
Client(s):	*Who wants it*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Must be available on schedule for the experiment to start. Networking resource (hardware).

8.2 System Management

The Online Filter Farm will consist of several thousands independent machines. The management and maintenance of the hardware and all the basic software (operating system, generic services (e.g. batch system etc.)) must be provided in order to keep the farm functional at all times during data taking.

Deliverable:	**8.2-a Hardware installation/management. Early on will take care of scaled down prototype setups.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	TriDAS, EFF Coordinator, Filter Units Coordinator
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Service disruptions = experiment deadtime.
Resource:	01/01/2003 - 31/12/2007: **0.5** FTE (0.0 available). System Manager.

Deliverable:	**8.2-b Operating System maintenance**
Description:	Installation, maintenance and upgrade of the operating system on all farm machines
Responsible:	*Responsible person*
Client(s):	EFF coordinator, Filter Units coordinator
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Service disruptions = experiment deadtime.
Resource:	01/01/2003 - 31/12/2007: **0.5** FTE (0.0 available). System Manager.

Deliverable:	**8.2-c Hardware database**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	EFF coordinator, shift crew, TriDAS management
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	A necessary tool for the management of O(1000) nodes farm.
Resource:	01/01/2003 - 31/12/2005: **0.2** FTE (0.0 available). DB designer.
Resource:	01/01/2006 - 31/12/2007: **0.5** FTE (0.0 available). DB maintainer.

Deliverable:	**8.2-d T0 Online connectivity**
Description:	Network bandwidth between the CMS site and CERN T0. See 1.1-**iv** System administration of connection to tier0.
Responsible:	*Responsible person*
Client(s):	TriDAS, Detector groups
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Network bandwidth + administration and maintenance
Resource:	01/01/2005 - 31/12/2007: **0.2** FTE (0.0 available). Net Admin.

Deliverable:	**8.2-e Load Sharing/Job Control**
Description:	Load sharing and other facilities for "non standard" online filtering. System administration of the online farm cluster, load sharing, batch queues etc.
Responsible:	*Responsible person*
Client(s):	EFF coordinator, Production Manager, EFF System Manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2003 - 31/12/2007: **0.3** FTE (0.0 available). System Admin.

8.3 Online code management

The online farm will have fast code turnover. An efficient independent code versioning system must be in place and maintained. Coordinated distribution of relevant software to all the nodes, centralised installation and configuration of the machines will have to be insured.

Deliverable:	**8.3-a Code Versioning/Distribution**
Description:	Maintain a software repository for online software. Manage versioning and distribution.
Responsible:	*Responsible person*
Client(s):	EFF Coordinator/Offline Production /PRS coordinators/ physicists
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2002 - 31/12/2007: **0.3** FTE (0.0 available). Librarian.

Deliverable:	**8.3-b System startup/sw installation**
Description:	Installation and maintainance of all the basic software needed for online applications. Provide facilities for global startup of the system.
Responsible:	*Responsible person*
Client(s):	EFF Coordinator, EFF System Manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2005 - 31/12/2007: **0.3** FTE (0.0 available). Software Admin.

8.4 Farm Monitoring

The status of hardware and performance of the machines in the farm will be monitored and controlled by the experiment shift crew. Most of the tools to provide this monitoring should be shared with other computing farms. Appropriate interfaces and services will be needed to collect the information and serve it to the various clients

Deliverable:	**8.4-a Status Monitoring/Fault Detection**
Description:	Provide services to monitor the farm status and detect hardware faults. Provide standard interfaces to these service for use from "Run Control"
Responsible:	*Responsible person*
Client(s):	EFF coordinator/ shift crew/ System Manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2003 - 31/12/2006: **0.5** FTE (0.0 available). Farm Toolsmith.

Deliverable:	**8.4-b Runtime monitoring**
Description:	Provide services to monitor system-level parameters of the farm, both at the global and the single node level
Responsible:	*Responsible person*
Client(s):	EFF coordinator/ shift crew / system manager
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	
Resource:	01/01/2004 - 31/12/2006: **0.5** FTE (0.0 available). Farm Toolsmith.

Part III

Physics Reconstruction and Selection (PRS)

9 Tracker - b Tau *(Marcello Mannelli, Lucia Silvestris)*

This task covers the implementation, support and documentation of the Tracker simulation, reconstruction, alignment, data-handling and analysis tools needed in order to fully reconstruct track and vertices using the Tracker Detector. These are considered by the CMS Tracker community as a deliverable, along with that of the Tracker detector itself. The same tools are fundamental in order to investigate the physics potential of CMS in general and, in particular, physics channels with include b's and tau's in the final state. The tagging of b's and tau's are the specific responsibility of the Tracker - b Tau PRS group. The definition of the optimal analysis strategies for the various physics channels is done in close coordination with the other PRS groups, where relevant. It's responsibility of the Tracker - b Tau PRS group guarantee that the tracker software is properly integrated in the final CMS software environment. This is done in close coordination with the CCS and TriDAS groups.
This task also includes the definition of Tracker b/Tau specific samples needed for background rejection and benchmark signal studies. The Monte-Carlo production will be done in close coordination with the CMS Production team.
A preliminary analysis of the different sub-tasks, their deliverables and the resources required was presented to the TIB on 23/10/2000. Here, next to each L3 sub-task, we reported the estimate of the required resources from this preliminary analysis. The further refinement of the L3 sub-tasks, and the corresponding allocation of manpower, are being carried out in the context of a series of mini-workshops. Mini-workshops on Track and Vertex reconstruction were held during of month of January,
see http://cmsdoc.cern.ch/cms/Physics/btau/management/top/workshop.html
The result detailed to task list can be found at this URL:
http://cmsdoc.cern.ch/cms/Physics/btau/management/activities/reconstruction/tracks.html
http://cmsdoc.cern.ch/cms/Physics/btau/management/activities/reconstruction/vertex.html
These mini-workshops included joint sessions with the ECAL - e gamma and Muon PRS groups, to discuss tracking issues directly relevant to the identification and reconstruction of these physics objects. The corresponding agendas and presentations can also be found at:
http://cmsdoc.cern.ch/cms/Physics/btau/management/top/workshop.html

Below we list the main Tracker - b Tau PRS sub-tasks.

9.1 Tracker Detector Simulation

This item covers the simulation issues related to the geometry and response of the Tracker Detector, as well as the implementation and integration of the relevant code in the CMS simulation projects (presently *CMSIM/OSCAR*). In particular, the parameters governing the relevant physics processes in GEANT3 and GEANT4 (such as cutoffs on δ rays, photons and low energy interactions) must be tuned to provide an adequate simulation of particle propagation through the tracker, and realistic charge deposition in the silicon sensors, as determined from experimental data. The existing models of detector and electronic response will be further refined in the *ORCA* project, and will then be ported to the *OSCAR* project. Also included are the various tools needed for debugging and validation of the simulation code and the Monte Carlo Production samples.
Resources needed: 6.5 FTE 2001, 3.5 FTE 2002 and 3 FTE 2003.

Deliverable:	**9.1-a Detector Simulation Geometry and Material Model in GEANT3**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	Existing code, debugging and optimisation are needed before end of April 2001
Risks/Constraints:	

Deliverable:	**9.1-b Detector Simulation Geometry and Material Model in GEANT4**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	Aim for completely new implementation end 2001
Risks/Constraints:	

Deliverable:	**9.1-c Validation Tools for Tracker simulation Geometry and Material Models**
Description:	
Responsible:	Tracker
Client(s):	Tracker
End Date:	Required by end of April 2001
Risks/Constraints:	

Deliverable:	**9.1-d Tuning of Tracker specific physics processes in GEANT3**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	Required by end of May 2001
Risks/Constraints:	

Deliverable:	**9.1-e Validation Tools for specific physics processes in GEANT3 simulation**
Description:	
Responsible:	Tracker
Client(s):	Tracker
End Date:	Required for end of April 2001
Risks/Constraints:	

Deliverable:	**9.1-f Tuning of Tracker specific physics processes in GEANT4**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	Goal: end 2001
Risks/Constraints:	

Deliverable:	**9.1-g Validation Tools for specific physics processes in GEANT4 simulation**
Description:	
Responsible:	Tracker
Client(s):	Tracker
End Date:	Goal: end 2001
Risks/Constraints:	

Deliverable:	**9.1-h Simulation of Detector Response (Sensor and Electronics)**
Description:	
Responsible:	Tracker
Client(s):	SPROM
End Date:	existing code, optimisation and modularity is needed end of April 2001
Risks/Constraints:	

Deliverable:	**9.1-i Validation Tool for Detector Response (Sensor and Electronics)**
Description:	
Responsible:	Tracker
Client(s):	Tracker
End Date:	Required by end April 2001
Risks/Constraints:	

Deliverable:	**9.1-j Tracker Fast Simulation**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.1-k Tracker Visualisation**
Description:	
Responsible:	Tracker
Client(s):	SPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.1-l Simulation of Tracker Position Monitoring System (PMS)**
Description:	
Responsible:	Tracker
Client(s):	Tracker Alignment sub-task
End Date:	
Risks/Constraints:	

Deliverable: **9.1-m Simulation of Distortions**
Description:
Responsible: Tracker
Client(s): Tracker Alignment sub-task
End Date:
Risks/Constraints:

Deliverable: **9.1-n Geometry Model for Test-Beam Set-up (on demand)**
Description:
Responsible: Tracker
Client(s): Tracker Test-Beam Team
End Date:
Risks/Constraints:

Deliverable: **9.1-o Simulation for Test-Beam Set-up (on demand)**
Description:
Responsible: Tracker
Client(s): Tracker Test-Beam Team
End Date:
Risks/Constraints:

9.2 Tracker Detector Reconstruction

This item includes the tracker reconstruction geometry model, cluster finding and position reconstruction, track and vertex reconstruction frameworks and algorithms, for use both in HLT and subsequent off-line analysis. This task includes the proper integration of the relevant code in the reconstruction project (presently *ORCA*). Also included are the various tools needed for debugging and validation of the reconstruction code and the Monte Carlo Production samples.

A fully functional track reconstruction chain exists, with several high quality algorithms implemented. A vertex reconstruction package also exits, with several algorithms at various stages of developments. For more details of ongoing and planned activities, refer to the URL's:
http://cmsdoc.cern.ch/cms/Physics/btau/management/activities/reconstruction/tracks.html
http://cmsdoc.cern.ch/cms/Physics/btau/management/activities/reconstruction/vertex.html
Resources needed: 7 FTE 2001, 5.5 FTE 2002 and 5.5 FTE 2003.

Deliverable: **9.2-a Tracker Cluster Finding**
Description:
Responsible: Tracker
Client(s): RPROM, Tracker Data-Handling sub-task and Tracker Alignment sub-task
End Date: existing code, debugging and optimisation are needed
Risks/Constraints:

Deliverable: **9.2-b Tracking Framework**
Description:
Responsible: Tracker
Client(s): RPROM and PRS
End Date: existing code, optimisation is needed
Risks/Constraints:

Deliverable: **9.2-c Material Effects on Track Reconstruction**
Description:
Responsible: Tracker
Client(s): RPROM and PRS
End Date:
Risks/Constraints:

Deliverable: **9.2-d Persistent Tracks**
Description:
Responsible: Tracker
Client(s): RPROM and PRS
End Date: Required by end of June 2001
Risks/Constraints:

Deliverable:	**9.2-e Reconstruction Geometry Model**
Description:	
Responsible:	Tracker
Client(s):	RPROM
End Date:	existing code, debugging and optimisation are needed
Risks/Constraints:	

Deliverable:	**9.2-f Combinatorial Track Finder Algorithm**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, debugging and optimisation are needed
Risks/Constraints:	

Deliverable:	**9.2-g New or Improved Track Finder Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-h Pixel Seed Generation Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, debug, optimisation is needed
Risks/Constraints:	

Deliverable:	**9.2-i Other Seed Generation Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-j Connection Machine Track Finder Algorithm**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, debugging and optimisation are needed
Risks/Constraints:	

Deliverable:	**9.2-k Validation (Analysis) Tools for the different Track Finder Algorithms**
Description:	
Responsible:	Tracker
Client(s):	PRS
End Date:	existing code, debugging and optimisation are needed
Risks/Constraints:	

Deliverable:	**9.2-l Tracking for Muons**
Description:	
Responsible:	Tracker and Muon
Client(s):	PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-m Vertices Framework**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, improvements to the framework are underway in order to facilitate the implementation of other algorithms
Risks/Constraints:	

Deliverable:	**9.2-n Primary Vertex Finder Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, debug, optimisation is needed
Risks/Constraints:	

Deliverable:	**9.2-o Secondary Vertex Finder Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	existing code, debug, optimisation is needed
Risks/Constraints:	

Deliverable:	**9.2-p Soft assignment vertex finding algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-q Hard assignment vertex finding algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-r Very displaced vertices and γ conversions**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	
Risks/Constraints:	

Deliverable:	**9.2-s Validation (Analysis) Tools for the different Vertex Finder Algorithms**
Description:	
Responsible:	Tracker
Client(s):	RPROM and PRS
End Date:	A preliminary version has recently been implemented. Debug and optimisation is needed
Risks/Constraints:	

Deliverable:	**9.2-t Reconstruction for Tracker Test-Beam (on demand)**
Description:	
Responsible:	Tracker
Client(s):	Tracker Test-Beam Team
End Date:	
Risks/Constraints:	

9.3 Tracker Detector Alignment

This item includes the development of the software tools needed for the Tracker alignment and for the integration with the Muon-link System. This second part will be done in close collaboration with the PRS Muon. The tools developed will be used to study the effects of mis-alignments at different reconstruction and selection stages, to link the muon and the tracker Position Monitoring systems, and to develop alignment strategies using both the information from the Tracker Position Monitoring System, and from reconstructed tracks.
Resources needed: 4.5 FTE 2001, 4.5 FTE 2002 and 4.5 FTE 2003.

Deliverable:	**9.3-a Metrology and alignment specifications**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.3-b Tools for displacing sets of detector modules**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.3-c Tracker Alignment Data-Base Prototype**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.3-d Specific cluster reconstruction algorithms for the Tracker Position Monitoring System**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.3-e Tracker Alignment Algorithms**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.3-f Software for the integration with the Muon-link System**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

9.4 Tracker Detector Data Handling

This item covers an important set of software tasks that lie at the interface between online reconstruction software and hardware. Optimisation and delivery of the these products benefit from good coordination between reconstruction software and data acquisition groups. This concerns, in particular, data synchronisation (in time), calibrations, FED cluster finder and zero suppression algorithms, hardware and software readout partitions, ADC dynamic range definition, data formatting and detector data monitoring.
Resources needed: 3.0 FTE 2001, 3.5 FTE 2002 and 3.5 FTE 2003.

Deliverable:	**9.4-a Tracker FED zero suppression algorithms**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-b Tracker Data Synchronisation (in time) algorithms**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-c Tracker Detector Data Monitoring**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-d Tracker Beam Test Data Monitoring (on demand)**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-e Tracker Calibration Data-Base Prototype**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-f Tracker Calibration algorithms**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-g Analysis Tools for Tracker Calibration Studies**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.4-h Analysis Tools for Tracker Data Volume Studies**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

9.5 b Tagging

This item covers the b tagging at the different stages of the reconstruction and event selection (L3 Trigger, off-line). Tools for common issues with other sub-detectors will be done in close collaboration with the other PRS groups. Resources needed: 5 FTE 2001, 5 FTE 2002 and 7 FTE 2003.

Deliverable:	**9.5-a Tools for b HLT Studies**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.5-b Tools for Jet Identification and Reconstruction**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.5-c Tools for Soft Lepton Tags**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.5-d Tools for b tagging based on Impact Parameters Methods**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.5-e Tools for b tagging based on Vertex Methods**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.5-f Analysis Tools in order to verify performance for single jets, QCD, top and Higgs.**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

9.6 Tau Tagging

This item covers the τ tagging at the different stages of the reconstruction and event selection (L3 Trigger, off-line). Tools for common issues with other sub-detectors will be done in close collaboration with the other PRS groups. Resources needed: 2 FTE 2001, 2 FTE 2002 and 3 FTE 2003.

Deliverable:	**9.6-a Tools for Tau HLT Studies**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.6-b Tools for tau tagging based on vertex for three prong decays**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.6-c Tools for tau tagging based on impact parameter for 1-prong decay**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

Deliverable:	**9.6-d Analysis Tools in order to verify performances for different channels**
Description:	
Responsible:	Tracker
Client(s):	CMS
End Date:	
Risks/Constraints:	

10 E-Gamma / ECAL *(Chris Seez)*

To co-ordinate all activities relating to ECAL software and analysis of electron and photon physics objects. To maintain an adequate level of coherence between these activities, ensuring, where necessary, an adequate cross-linkage between tasks, with a view to the eventual goal of obtaining physics results of high quality promptly from real data.

10.1 ECAL Simulation

Simulation model. Geometry. Use of GEANT3. Transition to GEANT4. Effect of GEANT cuts. Optimisation of geometric description.

Deliverable:	**10.1-a Geometry**
Description:	Geometry for GEANT3 and GEANT4 (in CMSIM and OSCAR). Geometry in agreement with construction parameters. Adequate description of passive material behind and in front of crystals. Canonical target longitudinal light collection curve of crystals to be included in the GEANT simulation. Adequate optimisation for performance.
Responsible:	ECAL
Client(s):	CMS
End Date:	End of 2001 for GEANT3. Early 2002 for GEANT4.
Risks/Constraints:	Final geometry is needed for tests against test-beam data.

Deliverable:	**10.1-b Fast simulation**
Description:	Simulation of electromagnetic showers in ECAL optimised for speed (to be used for physics studies). Trade off between speed and realism to be investigated and target performance defined.
Responsible:	ECAL
Client(s):	CMS
End Date:	
Risks/Constraints:	Physics TDR

10.2 ECAL detector response simulation and reconstruction

Digitisation simulation and reconstruction. Selective readout and zero suppression. Bunch crossing id. Trigger primitive generation.

Deliverable:	**10.2-a Maintenance, development and verification**
Description:	Code exists but needs maintenance, development and verification.
Responsible:	ECAL
Client(s):	CMS
End Date:	Continuous
Risks/Constraints:	

Deliverable:	**10.2-b Selective readout scheme**
Description:	Development of a selective readout and zero suppression scheme compatible with hardware being developed. Must satisfy data volume constraints with minimal or zero significant impact on physics.
Responsible:	ECAL
Client(s):	CMS
End Date:	Urgent.
Risks/Constraints:	Zero suppression cuts currently used in production simulation already have noticeable effects on reconstruction of unconverted photons and may impact on in situ calibration studies.

10.3 Electron/Photon High Level Triggers and Physics Objects

Development of algorithms and associated software for selection in high level triggers. Electron and photon identification. Testing and detailed results from large scale simulation.

Deliverable:	**10.3-a Level-2 selection**
Description:	Reduction of data rate from Level-1 trigger using limited information (ECAL+pixels). (At present we are using the terminology Level-2=ECAL alone; Level-2.5=ECAL+pixels)
Responsible:	PRS
Client(s):	CMS
End Date:	Provisional scheme already exists
Risks/Constraints:	LHCC Milestones imply working scenario by May

Deliverable:	**10.3-b Level-3 selection**
Description:	Reduction of data rate from Level-2 trigger using full detector information (i.e. including tracker)
Responsible:	PRS
Client(s):	CMS
End Date:	May 2001
Risks/Constraints:	LHCC Milestones imply working scenario by May

Deliverable:	**10.3-c Full selection chain to O(100Hz)**
Description:	Reduction of data rate to what gets written to permanent storage
Responsible:	PRS
Client(s):	CMS
End Date:	November 2001
Risks/Constraints:	LHCC Milestone. DAQ TDR.

10.4 ECAL Calibration

in situ calibration. First step is to develop credible scenario.

Deliverable:	**10.4-a Credible in situ calibration scenario**
Description:	Studies largely using software existing or being developed for HLT studies, to answer questions like: - calibration electron selection: efficiency (how long does it take) - unscrambling individual crystal constants (Householder method, or similar) - relation between electron and photon energy scales: non-linearities, eta (material) dependence etc - basket edges
Responsible:	ECAL
Client(s):	CMS
End Date:	November 2001
Risks/Constraints:	LHCC Milestone

10.5 ECAL Test Beam and Pre-Calibration

Software and software organisation for pre-calibration. Plan and definition of needs. Online checking. Reproducibility. Detailed comparison of test-beam data with ECAL simulation model. Availability of test-beam data for further checking against simulation in case of unexpected questions. Also included, for the moment, under this task are the follow items mainly related to specialised databases, their creation, population and use: the laser (crystal transparency monitoring) system, the in situ calibration database, the pre-calibration database, and the construction database

Deliverable:	**10.5-a** *Details of Test Beam and Pre-Calibration deliverables not available before full discussion with people involved in existing work*
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

11 Jets and Missing Transverse Energy / HCAL *(Shuichi Kunori, Sarah Eno)*

coordinate the various L3 efforts of the Jets and Missing Transverse Energy / HCAL group. Run bi-weekly meetings. maintain a web page with the results and status from the various L3 tasks.

11.1 HCAL Simulation

This item covers the GEANT3, GEANT4, and ”fast” parameterised descriptions of the HCAL response. The sensitivity of the response to GEANT parameters must be investigated and documented. The response must be tuned to any available test beam data. The results from the parameterised description must be compared to the GEANT-based descriptions.

Deliverable:	**11.1-a CMS note describing GEANT3 description and tuning**
Description:	A CMS note that describes the GEANT3 description of the HCAL, documenting its sensitivity to the GEANT parameters and hadron shower models, and showing comparisons to all available test beam data.
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

Deliverable:	**11.1-b CMS note describing GEANT4 description and initial tuning**
Description:	A CMS note that describes the GEANT4 description of the HCAL, documenting its sensitivity to GEANT parameters and hadron shower models, and showing comparisons to the GEANT3 description and the associated code.
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

Deliverable:	**11.1-c CMS note comparing GEANT4 response to test beam.**
Description:	A CMS note that describes the GEANT4 description of the HCAL, documenting its sensitivity to GEANT parameters and hadron shower models, and showing comparisons to the GEANT3 description and the associated code.
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

Deliverable:	**11.1-d CMS note describing the fast parameterised simulation of the HCAL and the associated code.**
Description:	A CMS note that describes the parametrisation and compares the results to those from the GEANT3 simulation. The note should also compare reconstruction of jets and missing transverse energy from both simulations.
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

11.2 HCAL Reconstruction and Test Beam

This item includes the development within ORCA of code to simulate the response of the HCAL electronics and to allow the analysis of test beam data. Also, the analysis of test beam data from summer 2002.

Deliverable:	**11.2-a CMS note describing code that allows the simulation of the HCAL electronics**
Description:	A CMS note that describes code developed in ORCA to simulate the HCAL electronics. should include effects of time jitter in the deposit of energy, the effect of multiple events per crossing, allow the testing of different algorithms for the extraction of energy and zero suppression.
Responsible:	HCAL
Client(s):	CMS
End Date:	July 2001
Risks/Constraints:	develop in time to do some testing of algorithms in early summer for hardware guys

Deliverable:	**11.2-b CMS note describing the studies of algorithms to be used in the electronics.**
Description:	A CMS note that describes different algorithms one could use for beam crossing identification, energy extraction at level 1, and zero suppression. Documentation of the effect of these algorithms on HCAL resolutions.
Responsible:	HCAL
Client(s):	CMS
End Date:	Nov. 2001
Risks/Constraints:	partial results for summer 2001 for electronics group, in time for fall 2001 production

Deliverable:	**11.2-c CMS note describing optimisation of HCAL algorithms at high luminosity energy**
Description:	CMS note describing optimisation of HCAL algorithms, such as zero suppression, energy extraction, and beam crossing identification for high luminosity.
Responsible:	HCAL
Client(s):	CMS
End Date:	Jan. 2002
Risks/Constraints:	none

Deliverable:	**11.2-d CMS note describing analysis of test beam data from summer 2002 test beam.**
Description:	A CMS note that describes the analysis of test beam data from the summer 2002 test beam.
Responsible:	HCAL
Client(s):	CMS
End Date:	Nov 2002
Risks/Constraints:	summer 2002 test beam must occur.

11.3 HCAL Calibration

This item involves the development of code to store calibration constants within ORCA, and to use them to calculate HCAL energies. Also, the development of methodologies to calibrate the HCAL in-situ.

Deliverable:	**11.3-a CMS note on calibration strategy for the HF**
Description:	A note describing methodology of HF calibration, re-calibration and ”in situ” monitoring including aging problems.
Responsible:	HCAL
Client(s):	CMS
End Date:	June, 2001
Risks/Constraints:	none

Deliverable:	**11.3-b CMS note on calibration strategy for the HB/HE**
Description:	A note describing methodology of HB/HE calibration, re-calibration and ”in situ” monitoring including aging problems.
Responsible:	HCAL
Client(s):	CMS
End Date:	June 2002
Risks/Constraints:	none

Deliverable:	**11.3-c CMS note describing methodology for storing HCAL calibration constants in an ORCA-compatible data base and the associated code.**
Description:	A note describing all the various kinds of calibration constants that will be stored in data bases for the HCAL, and how this will be done within the ORCA framework
Responsible:	HCAL
Client(s):	CMS
End Date:	Jan. 2002
Risks/Constraints:	coordination with the CMS-wide database effort.

Deliverable:	**11.3-d CMS-note describing the detailed methodology for in-situ calibration of the HCAL**
Description:	A CMS-note describing the methodology for calibrating HCAL ”in situ” using gamma+jet, Z+jet, isolated pions, energy flows and a study this methodology using full ORCA reconstruction.
Responsible:	HCAL
Client(s):	CMS
End Date:	Nov. 2002
Risks/Constraints:	none

Deliverable:	**11.3-e CMS note describing the optimisation of weights for the calorimeter layers for jet finding**
Description:	A CMS note describing the optimisation of weights for the calorimeter layers for jet finding. should include plots demonstrating that the weights have been successfully implemented into ORCA without bugs.
Responsible:	HCAL
Client(s):	CMS
End Date:	June 2001
Risks/Constraints:	none

11.4 Jet/MET Physics Objects and Higher Level Trigger

This item concerns the development of algorithms for the identification of jets, missing transverse energy, and taus. It also includes developing a trigger table for physics channels that do not include leptons.

Deliverable:	**11.4-a CMS note describing tau identification using the tracker in the HLT**
Description:	A CMS note describing tau identification using the tracking in the HLT
Responsible:	HCAL
Client(s):	CMS
End Date:	July 2001
Risks/Constraints:	tracking information available, sufficient production capacity

Deliverable:	**11.4-b CMS note detailing sources of jet energy resolution**
Description:	A CMS note detailing the sources of the jet energy resolution
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

Deliverable:	**11.4-c CMS note describing the implementation jet-finding that includes tracking and the identification of individual hadrons inside of jets and associated code..**
Description:	A CMS note describing the implementation jet-finding that includes tracking and the identification of individual hadrons inside of jets, including plots showing successful implementation in ORCA.
Responsible:	HCAL
Client(s):	CMS
End Date:	???
Risks/Constraints:	none

Deliverable:	**11.4-d CMS note describing a trigger table for physics for channels that do not contain leptons.**
Description:	A CMS note describing a trigger table for physics for channels that do not contain leptons, including Higgs to taus, invisible Higgs, SUSY to jets plus missing transverse energy, and ttH.
Responsible:	HCAL
Client(s):	CMS
End Date:	Dec 2001
Risks/Constraints:	manpower, adequate production facilities, 9.1-A, 9.2-A, 9.2-B, for LHCC milestone

Deliverable:	**11.4-e CMS note describing algorithms for removing fake jets**
Description:	A CMS note describing algorithms for removing fake jets caused by pileup at high luminosity. Should include plots showing the algorithm has been successfully deployed in ORCA without bugs.
Responsible:	HCAL
Client(s):	CMS
End Date:	June, 2001
Risks/Constraints:	student leaving

Deliverable:	**11.4-f CMS note describing an ntuple maker containing electrons, muons, jets, and missing transverse energy for ORCA and associated code**
Description:	A CMS note describing an ntuple maker containing electrons, muons, jets, and missing transverse energy for ORCA and associated code
Responsible:	HCAL
Client(s):	CMS
End Date:	June 2001
Risks/Constraints:	none

12 Muons *(Ugo Gasparini)*

The goal of this task is twofold: the development and integration in the CMS software environment of the simulation, reconstruction and analysis tools needed to fully exploit the capabilities of the CMS experiment in producing physics results using muons in the event final state; the detailed study of these capabilities and the definition of the strategies to obtain the optimal response in the various physics channels of interest, in close coordination with the other PRS tasks dealing with different physics objects.

12.1 Muon Detector Simulation

This item covers the simulation issues specific to the muon sub-systems, assuring the implementation and integration of the relevant code in the OSCAR simulation program. In particular, the proper simulation in the GEANT4 framework of the physics processes involved in the muon detection, including multiple scattering, muon showering and δ-ray production, neutron background parametrisation and punch-through effects, must be cross-checked against test-beam available data and already existing GEANT3 simulation results.

Deliverable:	**12.1-a Hit simulation in muon detector.**
Description:	Maintenance of existing simulation code in CMSIM and its porting in OSCAR/GEANT4.
Responsible:	MUON
Client(s):	CMS
End Date:	Continuous
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.1-b Verification of simulation model.**
Description:	Study of muon showering modelling, δ-ray production, punch-through effects.
Responsible:	MUON
Client(s):	PRS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.1-c Neutron background parametrisation.**
Description:	Provide neutron parameterisation in CSC,DT and RPC chambers, according to latest shielding geometry.
Responsible:	MUON
Client(s):	PRS
End Date:	Sept.2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*

12.2 Muon Detector Reconstruction

This item covers the reconstruction issues specific to the muon sub-systems, assuring the implementation and integration of the relevant code in the ORCA program. In particular the maintenance of already existing hit digitisation and reconstruction, L1 trigger simulation and local track reconstruction code in the Drift Tubes, RPC and CSC muon systems must be guaranteed, as well as further developments to improve the code performance and to allow transparent usage of the code at the following stages of the reconstruction, including integration with other detectors and studies of alignment and calibration issues.

Deliverable:	**12.2-a Digitisation in ORCA.**
Description:	Maintenance and update of hit digitisation code in CSC, DT and RPC systems. Implementation of neutron background effects.
Responsible:	MUON
Client(s):	PRS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.2-b Muon L1 trigger simulation in ORCA.**
Description:	Maintenance and update of L1 trigger primitive generation in CSC, DT and RPC systems. Global Muon Trigger simulation code.
Responsible:	MUON
Client(s):	PRS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.2-c Local track reconstruction in muon system.**
Description:	Maintenance and update of muon track candidates reconstruction code in muon system.
Responsible:	MUON
Client(s):	PRS
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

12.3 Muon Detector Alignment, Calibration, and Databases

The aim of this sub-task is the development of the software tools needed for the alignment and calibration studies in the muon system. In particular, the interface of existing muon alignment software with the ORCA reconstruction, together with the development of general software tools to displace/rotate in ORCA the muon subdetector units, is mandatory to study mis-alignment effects at different reconstruction/selection stages (L1 trigger, HLT, off-line) , to link the muon and the tracker alignment systems and to develop strategies for alignment corrections using the event data. As far as calibration is concerned, the simulation of realistic trigger synchronisation data and specific behaviour of electronic-channels to be recorded in the Calibration Database must be provided, and strategies for calibration updating using event data must be studied. Finally, tools for converting the existing geometry detector database developed within CMSIM to a GENT4/OSCAR format, including recent and possible future updates, also from engineer drawings, must be developed.

Deliverable:	**12.3-a Geometry database.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	MUON
Client(s):	PRS, Alignment group
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.3-b ORCA interface to muon alignment software.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	MUON
Client(s):	PRS, Alignment group
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.3-c Tools for alignment studies in ORCA and strategy for alignment with tracks.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.3-d Calibration database and tools for trigger synchronisation.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

12.4 Muon Test Beams and Monitoring

This item has to provide and maintain transparent and user-friendly interface of muon test-beam data to the event object database of CMS, allowing the usage of reconstruction code developed in the ORCA framework in the test-beam analysis activities. Tools for online software (e.g. event monitoring) and forthcoming combined test-beam activities (e.g DT+RPC , CSC+RPC) must be provided as well.

Deliverable:	**12.4-a Interface of muon test-beam data to CMS ODBMS.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.4-b Muon test-beam monitoring.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.4-c Muon reconstruction in test-beam data with ORCA.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.4-d Common software for combined Test-beams.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

12.5 Muon Physics Objects

The goals of this sub-task are the muon identification at the different stages of the reconstruction and event selection (L2 and L3 triggers, off line), the definition of algorithms to identify and select interesting events for the different Physics channels with muon(s) in the final state, the development of benchmark physics analyses using the full detector simulation and reconstruction chain developed in the OSCAR and ORCA frameworks. Tools for common issues with other sub-detectors (e.g. muon-tracker matching, energy isolation algorithms, minimum ionising particle definition) must be developed in close collaboration with other PRS groups. The setting-up of Monte Carlo productions, including the configuration of MC generators and the definition of relevant samples needed for background rejection and benchmark signal studies, is a crucial part of this sub-task activity.

Deliverable:	**12.5-a Muon L2 trigger selection.**
Description:	Reduction of data rate from L1 trigger using Muon (L2.1) and calorimetric (L2.2) information. Seeding of L3 reconstruction.
Responsible:	PRS
Client(s):	CMS
End Date:	June 2001
Risks/Constraints:	Realistic L1 simulation needed. Working L2 scheme by May 2001.

Deliverable:	**12.5-b Muon L3 trigger selection.**
Description:	Reduction of data rate from L2 trigger to O(100) Hz using tracker data. Definition of physics selection strategies.
Responsible:	PRS
Client(s):	CMS
End Date:	End 2001
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.5-c Muon identification.**
Description:	Define muon as physics object to be used at various level of selection (L2, L3, off-line). Define muon quality categories (tight, standard, loose), study matching and isolation criteria. Matching with m.i.p. deposits in calorimeters.
Responsible:	PRS
Client(s):	CMS
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**12.5-d Configuration of MC productions for HLT, Physics TDR and specific detector studies.**
Description:	*Elaborate on purpose and functionality.*
Responsible:	PRS
Client(s):	CMS, MUON
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Part IV

Cross-Project Integration Groups and Task Forces

13 SPROM: Simulation PROject Management *(Albert de Roeck)*

This item covers the development and validation of software to simulate physics processes in CMS and test beam set-ups. This includes the already existing GEANT3 based simulation package (CMSIM), a GEANT4 based simulation package (OSCAR) and a fast simulation package (FAMOS).

13.1 Physics Event Generator Infrastructure

This item covers the software required to support external physics event generator programs in the CMS environment. In particular, it includes software for the management of input parameters in a consistent fashion and procedures for storing output events with a standard format for subsequent use by, for example, OSCAR and the Fast Simulation software. This task does not cover the software of the generator programs themselves.

Deliverable:	**13.1-a Validated interfaces for third-party event generator programs.**
Description:	Validated interfaces for third-party event generator programs to allow them to be used in CMS Physics studies.
Responsible:	*Responsible person*
Client(s):	*Required by the simulation software packages*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	

13.2 GEANT3-Based Detailed Detector Simulation

CMSIM is the Fortran-based CMS simulation package. Since new development has essentially ceased, CMSIM will need to be supported for physics studies until GEANT4 and the corresponding OSCAR simulation software have comparable functionality. Maintain while required the Fortran Simulation of the CMS detector. Does not include manpower for detector code changes.

Deliverable:	**13.2-a Validating new releases of CMSIM**
Description:	Validating new releases of CMSIM for production and private use
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	

13.3 GEANT4-Based Detailed Detector Simulation

This item covers the full simulation of particles traversing the CMS detector using the GEANT4 Toolkit, including the use of an appropriate detector description. Tuning and validation of physics processes, e.g. on test beam data is assumed to be taken care of by, or done in collaboration with, the PRS groups. OSCAR will provide simulated signal and background events for ORCA. It will also be used to develop and tune parameters and algorithms of the Fast Simulation software.

Deliverable:	**13.3-a Validate new releases of OSCAR**
Description:	Validating the different example programs, i.e.. the full CMS detector and test beam set-ups
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*evaluate risk and resources*

Deliverable:	**13.3-b Development of a G4 geometry instantiation tool**
Description:	Development of a G4 geometry instantiation tool from the DDD in XML or other
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	

Deliverable:	**13.3-c Development of a geometry validation tool**
Description:	Development of a geometry validation tool, set-up of G4 graphics tools.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*...*

Deliverable:	**13.3-d Porting and maintain of OSCAR in the CARF framework**
Description:	OSCAR in CARF, validate ORCA/OSCAR interface, persistent hit storage, organisation of simulation meta data, user interface
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*...*

Deliverable:	**13.3-e OSCAR performance optimisation for production and OSCAR development**
Description:	OSCAR performance optimisation for production, implementation of non-PRS covered detector parts such as beam-pipe, B-field
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*...*

13.4 Fast Detector Simulation

This item covers fast simulation of particles traversing the CMS detector and the response of the detector elements, readout electronics, and triggers. Parameterisations will be verified with OSCAR simulations, test-beam analyses, and ultimately real CMS data. The Fast Simulation should use the common Detector Description and be consistent OSCAR, ORCA, and the Physics Object Reconstruction software to permit flexible the use of varying degrees of simulation detail according to the requirements of the user. Two levels of fast simulation can be envisaged, i.e. one where the GEANT4 toolkit is used, but making use of fast shower algorithms and averaged materials, and one which will be a full parametrised simulation package, similar to the present CMSJET program. Proper averaging of materials is expected to be done in the PRS groups

Deliverable:	**13.4-a Validating releases of FAMOS**
Description:	Validating new releases of FAMOS for CMS production and private use, documentation
Responsible:	*S. Wynhoff*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*...*

Deliverable:	**13.4-b Fast shower algorithms: EM**
Description:	Development of fast shower Algorithms, replacing GEANT detailed showering: electromagnetic showers
Responsible:	*who*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*...*

Deliverable:	**13.4-c Fast shower algorithms: HAD**
Description:	Development of fast shower Algorithms, replacing GEANT detailed showering: hadronic showers
Responsible:	*who*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Describe constraints, assumptions and risks.

Deliverable:	**13.4-d Fast parametrised simulation for tracking**
Description:	A fast parametrised simulation for tracking detectors in CMS, not using the GEANT framework
Responsible:	*who*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Describe constraints, assumptions and risks.

Deliverable:	**13.4-e Fast parametrised simulation for calorimeters**
Description:	A fast parametrised simulation for calorimeters in CMS, not using the GEANT framework
Responsible:	*who*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Describe constraints, assumptions and risks.

Deliverable:	**13.4-f Physics Objects in a fast simulation**
Description:	Implement Physics Objects in a fast simulation, starting from reconstructed objects
Responsible:	*who*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Describe constraints, assumptions and risks.

14 RPROM Task: Reconstruction *(Stephan Wynhoff)*

The RPROM task force is responsible for the coordination of the development of CMS reconstruction software between the CCS, PRS and TriDAS projects. It provides consistent and tested releases of the basic reconstruction code, the high-level reconstruction code for production and physics analysis and the reconstruction code for the higher level trigger on the online farm.

14.1 Basic Reconstruction Software

The basic reconstruction software. It contains the modelling of detector response to simulated particles (SimHits) taking into account pileup effects, modelling of electronics response to signals from the detector, modelling of detector related and electronics noise and the simulation of the Level 1 triggers decisions to emulate the detector response for Monte-Carlo events (Digits).

For both simulated and real data it provides software to reconstruct track segments, cluster etc. within individual subdetectors, basic objects like tracks or simple jets. Time dependent detector effects can be taken into account during the reconstruction.

Deliverable:	**14.1-a** *ORCA*
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	The code specific to each subdetector is the responsibility of the subdetector community. The PRS groups provide the high-level reconstruction code and trigger algorithms.
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

14.2 Full Reconstruction Software (Integration with physics code)

The full reconstruction software is based on selected ORCA releases and extended by selected algorithms to reconstruct high level specialised objects (physics objects). Releases of this code will be used for official production and forms the reference software for physics analyses.

Deliverable:	**14.2-a** *ORCA++*
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	Production centres, physics groups, individual physicists
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

14.3 Online Reconstruction Software (Integration with TriDAS)

The online reconstruction software is running on the event filter farm. It is based on ORCA and includes the higher level trigger code used for event selection. It also contains code to verify the physics performance of the detector in real-time and identify problems with the data as soon as possible.

Deliverable:	**14.3-a** *ORCA-online*
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	Online farm
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

15 "CPROM" (?) Calibration Project Management *(Coordinator name)*

This task aims to provide the software infrastructure to support the determination, storage and provision of data describing the detector configuration. This includes the engineering description, validation data, alignments, energy calibrations, etc. using data from: test beams; laboratory measurements; survey data; in-situ dedicated systems; slow control systems; and and physics event samples.

15.1 Validation of Physics Data Quality

This subtask is responsible for validation of event data prior to subsequent reconstruction and analysis.

15.2 Calibration of Event Data

This item covers software associated to the calibration of the CMS subdetectors including alignments, energy calibrations, etc. using data from: test beams; laboratory measurements; survey data; in-situ dedicated systems; slow control systems; and and physics event samples. The Calibration clients include ORCA and potentially the OSCAR and Fast Simulation projects, which may ultimately incorporate realistic detector performance data into the simulations.

15.3 Luminosity Determination

Subtask Description here...what it aims to achieve and key functionality... should be easy to check if achieved or not *...type some explanatory text here...*.

16 Café: CMS Architecture Forum for Evaluation *(James Branson)*

Task Description here...what it aims to achieve and key functionality... should be easy to check if achieved or not *...type some explanatory text here....*

16.1 Analysis of Use Cases and Requirements

Design, validate and support architectures for CMS projects. *...type some explanatory text here....*

Deliverable:	**16.1-a Documentation of the Existing CMS Architecture**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**16.1-b Documentation of Critical Use Cases and Requirements**
Description:	*Elaborate on purpose and functionality.*
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

17 GPI: Group for process improvement *(Johannes Peter Wellisch)*

Scope of the Process Improvement Group:
It is the intention of CMS to deploy and continuously improve a coherent set of software processes for all aspects of physics software development, including simulation, higher-level triggering, reconstruction and selection, physics analysis and visualisation, and core software.
Mandate of the Group for Process Improvement:
The process improvement group defines and improves software processes in use in CMS. It carries the responsibility for process infrastructure requirements, and establishment and improvement of software processes in CMS. One fundamental risk to the software related projects in CMS is that due to software or integration faults data are not taken, or the data taken are insufficient for the calculation of trigger efficiencies. It is the primary responsibility of the Process Improvement Group to address this risk by ensuring quality and reproducibility of results.

17.1 Software Process

This item covers the processes associated with the definition, design, development, documentation, integration, verification, deployment, and maintenance of the CMS Software with the aim of optimising efficiency and quality. The pragmatic ”Cyclic Life Cycle” model has been adopted by CMS that emphasises continuous improvement following ISO/IEC 15504 (SPICE). Items which have been implemented include the structure of the ORCA, OSCAR, FAMOS, and IGUANA software repository and the strategy for development, release and testing, and the CMS coding rules, guidelines, and style. Processes currently under construction and only partly deployed include the more comprehensive assessment of user requirements, checking of software dependencies between software sub-systems and packages, automated checking of coding rule and style conformance, and more comprehensive integration test suites and examples. Processes to be implemented more rigorously in future include: more formal and uniform software requirements analysis and design procedures; documentation of code design, implementation, and usage; and problem reporting, tracking and resolution mechanisms. Deliver tools and methodologies to encourage and support efficient software management and quality assurance. The task here in more general terms is to establish a set of organisational processes for all software life-cycle activities, based on organisational alignment with the goals of our experiment, to assess in how far the different areas are indeed relevant to CMS and contributing to our success, and to improve the important processes continuously to the level where effort and gain are judged to be balanced in view of our goal of taking data doing great physics.

Deliverable:	**17.1-a Mission statements**
Description:	Define for each process instance invoked the goals the are to be achieved by following the process, and their relation to the goals of CMS as a whole. Include also examples of consequences of non-compliance
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-b Process scopes**
Description:	Identify for each process instance invoked the activities, roles, authorities and responsibilities. These then are to be ratified and enforced by project management.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	Already started.
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-c Process descriptions and tailoring guidelines**
Description:	Define and document the processes performed in CMS, including for each process instance invoked the input and output work products, entry and exit criteria, check-points, external interfaces with related processes that produce inputs and/or need the results, internal dependencies between the process activities, and metrics and measures that allow to demonstrate the achievement of the process. Establish tailoring guidelines that describe how to optimise a specific process for individual sub-projects. Note that active but restricted contribution of the process/environment team to development at all levels is necessary to ensure the validity of the approach.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	Already started.
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-d Performance expectation documents.**
Description:	Establish a document describing the performance expectations when using the process defined in the process description.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	Can start now.
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-e Deployed process**
Description:	Deploy the defined and ratified processes throughout CMS, as far as applicable, and verify deployment at established check-points using assessment methods.
Responsible:	Everybody in CPT.
Client(s):	CPT developers and engineers
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-f Maintained process definition**
Description:	Maintain the process description documents.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-g Improvement opportunity report (which would typically be a presentation)**
Description:	Identify possibilities for improvement, and define the scope of the improvement activity.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-h Impact analysis**
Description:	Define the priorities of improvement, and define measures for the impact of the improvement. Deploy the new process as prototype in one area, and confirm the improvement.
Responsible:	*Responsible person*
Client(s):	CMS
End Date:	Prior to process change
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.1-i New deployed process**
Description:	Update the process definition, and deploy the new process across the board. Concrete improvement actions are at present foreseen in configuration management, validation, software QA, and requirements elicitation.
Responsible:	*Responsible person*
Client(s):	CPT developers and engineers
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

17.2 Quality management

The goal of Quality Management is to make sure that the software satisfies the people using it. It needs the establishment of a focus on monitoring the quality of products and processes. Quality goals will be written down based on what we need, including implicit and explicitly stated requirements, for a set of check-points within the project life-cycle. An overall strategy will be defined to achieve these stated goals, and identified quality control and assurance activities will be performed and their performance will be confirmed. The actual state will be monitored against the goals, and appropriate action will be taken then the goals are not achieved. A typical means on quality management are joint reviews.

Deliverable:	**17.2-a Quality goals**
Description:	Based on what we need in terms of quality in the various operational environments, establish quality goals for the products throughout the project. Make sure these can be checked in a quantitative manner.
Responsible:	*Responsible person*
Client(s):	CMS
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.2-b Overall quality strategy**
Description:	Establish an overall strategy at the organisational and project level that allows to achieve the defined goals. Define metrics that will be used to measure the results of the various project activities, and by defining acceptance criteria at a course grained level, that will help to understand if the documented quality goals have been achieved.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Quality goals identified.

Deliverable:	**17.2-c Quality activity specification**
Description:	For each goal, identify quality control and assurance activities, which will help to achieve the goals set at the organisational and project level. Note that the hand-shake with quality assurance is important, as these activities have to be integrated into the software development.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Overall quality strategy available.

Deliverable:	**17.2-d Quality assessment record**
Description:	Assess the quality throughout the project at pre-defined check-points, applying the specified quality metrics to assess if the project is on track to meat the goals specified.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Quality activity specification available.

Deliverable:	**17.2-e Eventual corrective actions**
Description:	In case high level quality goals have not been met, take corrective or preventive action at the project and organisational level, where appropriate.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

17.3 Verification

Verification confirms that a piece of software, a process or a project reflects the specified requirements and use-cases. It includes a verification strategy, verification criteria for the individual software work products, performance of the verification activity, ensuring that identified faults/defects/bugs can and will be found and fixed, and that any results of the activity can/will be made available to all people concerned.

Deliverable:	**17.3-a Verification strategy**
Description:	Provide a document specifying the criteria by which software, documentation, etc. will be verified, and which work-products are to be verified.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or “before xxx”, or “after yyy”.*
Risks/Constraints:	Assumes that we need actually this.

Deliverable:	**17.3-b Verification results**
Description:	Perform verification, recording the results as needed, and specified in the corresponding strategy paper.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Verification strategy was made available, and we actually want to do this.

Deliverable:	**17.3-c Closed action item**
Description:	Track initiated corrective action to closure, and maintain action list.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Action list available.

17.4 Validation

Validation or productisation confirms that the software is fit for a specific intended use. It includes the production and implementation of a validation strategy for each intended use considered, the identification of validation criteria for each piece of software, the performance of the validation activity, the resolution of the problems identified, providing evidence that the software is fit for a specific use (for example trigger), and that any results of the activity can/will be made available to all people concerned.

Deliverable:	**17.4-a Validation strategy**
Description:	Write down a validation strategy paper, that specifies the use-cases and operational environments and software/system concerned, along with validation criteria and fit-conditions for all items involved.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Can start now, but will have to turn into an ongoing activity.

Deliverable:	**17.4-b Validated software/system**
Description:	Identify the techniques, processes, test-cases etc. where not specified in the validation strategy, and perform the validation tests, ex when validating code for the trigger environment. Record validation results and fault history. Create and maintain a list of action items, and track all corrective actions to closure.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	Validation strategy available.

Deliverable:	**17.4-c Acceptance testing**
Description:	Ensure basic functionament, using a sub-set of the full validation suite.
Responsible:	*Responsible person*
Client(s):	CMS-CPT
End Date:	Ongoing.
Risks/Constraints:	*Describe constraints, assumptions and risks.*

17.5 Software Re-use management

The purpose is to promote and ease the use of new and/or existing software from both the people and the product perspective. This includes the identification of domain and single task components that have a strong potential to be re-usable, and to work together with the corresponding CCS task to achieve their productization and advertizement in the collaboration.

Deliverable:	**17.5-a Re-usable item**
Description:	Identify re-usable entities, and establish their re-usability. Maintain consistency, stability, and standardisation of re-usable entities, with a particular focus on components for which re-use increases the overal reliability of a production cycle.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

Deliverable:	**17.5-b Information session**
Description:	Inform potential users about the existence of re-usable entities, including features and possible restrictions or problematic areas.
Responsible:	*Responsible person*
Client(s):	*Who wants the deliverable? As specific as possible.*
End Date:	*A date, or "before xxx", or "after yyy".*
Risks/Constraints:	*Describe constraints, assumptions and risks.*

18 Grid System Development *(Harvey Newman/Paolo Capiluppi)*

This item covers the development and deployment of Grid systems, tools and infrastructure that will allow to CMS to use its worldwide distributed facilities for data access, processing and analysis effectively. Early deliverable include a distributed file service that will support automated production, distribution and storage at the destination of sets of simulated and reconstructed. In the longer term, the Grid tools will work with the CARF software framework, the ODBMS and the Globus replica catalog to allow users to access persistent object collections transparently, within the limits imposed by the computing, data handling and network speeds of the available systems. Monitoring tools will be provided that allow tasks to be assigned to sites able to complete the tasks within a reasonable turnaround time. Interactive monitoring tools will be available to guide users and production managers by giving information on the status, progress, and estimated times-to-completion of pending tasks, as well as the status and the workflow at the facilities where the tasks are being executed. The Grid systems will be built on the Globus security and information infrastructures, in order to allow sites in different world regions to share resources fairly according to established policies, and to allow secure access to resources by remote users throughout the world.

18.1 Grid System Prototype Development

Develop prototypical Grid system components, and subsystems, leading to the final Grid systems by the time of LHC operations. The prototypes will consist of a sequence of vertically integrated systems with increasing functionality, released annually (and at more frequent intervals as needed), to meet CMS' needs for distributed data production and distributed analysis in support of the DAQ, CCS and Physics TDRs. Milestones for the prototype Grid systems also will include large scale testbed exercises among the prototype Tier0, Tier1, and Tier2 centers, in order to detail and progressively refine the requirements for the data analysis and for the development of the final Grid systems. This work will be done in collaboration with the recognised Grid projects (PPDG, GriPhyN, and DataGrid) to specify and test the Grid tools and systems, and to integrate them effectively with CARF and the CMS reconstruction, simulation and analysis applications. Wherever possible tools developed by the recognised grid projects, and their standard APIs, conventions, and methods, will be used to ensure consistency and to allow CMS and other experiments to coexist when using Grids using shared computing and networking infrastructures.

Deliverable:	**18.1-a Proof of Concept: Grid-Enabled Data Production**
Description:	Completion of a CMS production cycle between multiple sites where parts of the production cycle use Grid tools, including the Globus Information Service (GIS), Replica Catalog (GRC), Security Infrastructure (GSI), GDMP and a hierarchical Resource Manager (HRM) interfaced to HPSS, ENSTORE (at FNAL) and CASTOR (at CERN). This is a first milestone where some of the CMS-specific production tools are replaced by Grid tools. Grid tools and grid-aware tools are used in CMS production efforts to support: file-level replication; a global view of where all production data is in terms of files; smooth submission and management of jobs to a single site. GDMP is used by default for all CMS wide-area data movement in production efforts; exceptions can be made for production sites where GDMP cannot be installed, for policy reasons.
Responsible:	*Responsible person*
Client(s):	CMS CCS and PRS Groups; Grid Projects and the CMS Grid Group (CGG)
End Date:	December 2001
Risks/Constraints:	Network bandwidth; adoption of uniform services by all Grid projects; HRM interface to CASTOR being ready.

Deliverable:	**18.1-b Full support of Grid authentication in CMS**
Description:	CMS has the ability to supply an authenticated grid identity via a proxy at login, to every CMS collaborator who needs one. CMS collaborators can use this identity to access any Grid system, or testbed, or service that they as individuals are allowed to access.
Responsible:	*Responsible person*
Client(s):	Grid Projects and CGG
End Date:	June 2002
Risks/Constraints:	Adoption of uniform services by all Grid projects; consistent cross-linking of security policies and procedures among sites.

Deliverable:	**18.1-c Functional Prototype: First Secure Grid System for Data Production and Analysis**
Description:	Completion of a CMS production cycle between multiple sites where half of the CMS production efforts are completed using Grid tools. The Grid toolset by this time will include a first set tools for task monitoring, optimal task assignment to sites, authentication throughout the Grid testbed using proxies, and an agent-based information gathering subsystem, in addition to the tools used in the Proof of Concept Prototype. Grid tools and grid-aware tools are used in CMS production and analysis efforts to support: sub-file-level data access, extraction, and replication; a global view of where all production data is in terms of object-collection names, and the physics parameters of the production runs; smooth submission and management of jobs on a Grid of sites. All CMS production efforts using grid tools are fully secured based on standard Grid security solutions.
Responsible:	*Responsible person*
Client(s):	CMS CCS PRS and TriDAS Groups; Grid Projects and CGG
End Date:	December 2002
Risks/Constraints:	Network bandwidth; adoption of uniform services by all Grid projects; consistent cross-linking of security policies and procedures among sites.

Deliverable:	**18.1-d Fully Functional Prototype: Pre-Operations Grid System for Data Production and Analysis**
Description:	Completion of a CMS production cycle between multiple sites where by default all of the CMS production efforts are completed using Grid tools. The Grid toolset by this time will include a metadata catalog to map object collections onto a set of files, tools for recovery from error conditions leading to incomplete transactions; workflow management and task redirection protocols; and high level monitoring tools aimed at end-to-end system management. Grid tools and grid-aware tools in CMS production and analysis efforts support object-level and event-level data access and replication, and smooth submission and management of jobs at the majority of sites. The tools also provide a global view of where all production data is, in terms of the physics properties of the events in the production runs. Physicists doing analysis (do not have to know about files but) can use a data model that contains only physics concepts, concepts like cuts, and (optionally) references to the reconstruction algorithms used, and event sets referred to by name that contain selected objects useful for a particular analysis.
Responsible:	*Responsible person*
Client(s):	CMS CCS PRS, TriDAS and Physics Analysis Groups; Grid Projects and CGG
End Date:	December 2003
Risks/Constraints:	Network bandwidth; adoption of standards-compliant services by all participating sites; agreement among sites on policies for fair-sharing and resource exchange; consistent security policies and procedures among sites; seamless interfaces the Grid system, CARF and the chosen ODBMS.

18.2 Grid System Development for CMS Physics

Select Grid middleware products and design the interfaces to CMS software for the Grid System to be used during LHC operations. Implement interfaces to Grid services using the standard APIs, adapting them to the configuration and conditions at each Tier0, Tier1 and Tier2 site. Deploy and test the production system over a period of 18 months prior to the first LHC physics run.

Deliverable:	**18.2-a Selection of Grid Middleware Products; Detailed Design of Final Grid System**
Description:	Selection by CMS of the Grid middleware products that will be used to build the unified collaboration-wide CMS Grid system. Design details and interfaces for the production system agreed upon by CMS and the Grid projects.
Responsible:	*Responsible person*
Client(s):	CMS CCS Groups; Grid Projects and CGG
End Date:	December 2004
Risks/Constraints:	*some risks ?*

Deliverable:	**18.2-b CMS Grid System for LHC Operations**
Description:	Deployment of the unified collaboration-wide CMS Grid system, to be used during LHC operations. Final testing and development stages, up to the start of CMS physics running.
Responsible:	*Responsible person*
Client(s):	CMS CCS and Analysis Groups; Grid Projects and CGG
End Date:	December 2005 - June 2006
Risks/Constraints:	*some risks ?*

18.3 Interaction with the Grid Projects

Coordination with the PPDG, GriPhyN, DataGrid and other national Grid projects, in order to develop a consistent standards-based Grid System meeting CMS' needs.

Deliverable:	**18.3-a Specify Common Requirements for the Grid Projects**
Description:	Specify common requirements and deliverables from the Grid Projects: PPDG, GriPhyN and DataGrid; agree on the deliverables with the Grid Projects. CMS intends to create one set of requirements for its production grid system in 2006, and to feed these into all grid projects for which it is a customer/collaborator. This milestone is for the completion of a complete first version of these requirements. After that the requirements will be continuously revised over time. The common requirements activity requires constant interaction between CMS personnel and the Grid projects in 2001, particularly because the three projects have slightly different time-lines and procedures for their requirements efforts.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; Grid Projects
End Date:	December 2001
Risks/Constraints:	*some risks ?*

18.4 Partnership with the Particle Physics Data Grid (PPDG) Project

Coordination with the PPDG project to specify and then progressively integrate the PPDG deliverables with CMS software.

Deliverable:	**18.4-a Year 1 PPDG Deliverables to CMS**
Description:	These deliverables focus on extension of, and integration with existing CMS software. Deliverables concern activities on a formal job description language, pre-production work on job scheduling and management, basic monitoring, integration between GDMP and mass storage systems using HRMs, file and replica catalogs, reliable file transfer.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; PPDG Project
End Date:	August 2002
Risks/Constraints:	*some risks ?*

Deliverable:	**18.4-b Year 2 PPDG Deliverables to CMS**
Description:	These deliverables focus on on extended functionality, as well as adaptation and use by CMS of some PPDG deliverables that were made in year 1 to other experiments. Deliverables concern activities on remote job submission, management of production activities, integration with monitoring, storage resource discovery and scheduling, enhanced replication services including cache management, and enhanced file transfer services.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; PPDG Project
End Date:	August 2003
Risks/Constraints:	*some risks ?*

Deliverable:	**18.4-c Year 3 PPDG Deliverables to CMS**
Description:	These deliverables focus on the integration into a common infrastructure across experiments. Deliverables concern activities on object and event level access in jobs, data re-clustering and re-streaming, fully integrated monitoring, enhanced resource discovery.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; PPDG Project
End Date:	August 2004
Risks/Constraints:	*some risks ?*

18.5 Partnership with the European DataGrid Project

Coordination with the EU DataGrid (EUDG) project to specify and then progressively integrate the EUDG deliverables with CMS software. *NOTE: the EUDG deliverables are still relatively vague and subject to change. Review of these deliverables by the CGG in cooperation with EUDG management is required.*

Deliverable:	**18.5-a Month nine (M9) EUDG deliverables to CMS**
Description:	This milestone marks the first integration release of grid components by the work-packages in the EU DataGrid project. The components are not expected to provide production quality services but this release is considered important to demonstrate the viability of the approach of the project.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	August 2002
Risks/Constraints:	*some risks ?*

Deliverable:	**18.5-b Start of “Production Phase” of Release 0 EU DataGrid testbed**
Description:	The start of each production phase marks the release of an integrated and tested set of EU DataGrid Grid components by work-package 6 (WP6) of the EU DataGrid project.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	January 2002
Risks/Constraints:	*some risks ?*

Deliverable:	**18.5-c Start of Production Phase of Release 1 EU DataGrid testbed**
Description:	The functionality and goals of this testbed for CMS still needs to be specified, and described here.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	July 2002
Risks/Constraints:	*some risks ?*

Deliverable:	**18.5-d Start of Production Phase of Release 2 EU DataGrid testbed**
Description:	The functionality and goals of this testbed for CMS still needs to be specified, and described here.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	January 2003
Risks/Constraints:	*some risks ?*

Deliverable:	**18.5-e Start of Production Phase of Release 3 EU DataGrid testbed**
Description:	The functionality and goals of this testbed for CMS still needs to be specified, and described here.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	July 2003
Risks/Constraints:	*some risks ?*

Deliverable:	**18.5-f Start of Production Phase of the Final Release EU DataGrid testbed**
Description:	The functionality and goals of this testbed for CMS still needs to be specified, and described here.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	January 2004
Risks/Constraints:	*some risks ?*

18.6 Partnership with the Grid Physics Network (GriPhyN Project

Coordination with the GriPhyN project to specify and then progressively integrate the GriPhyN deliverables with CMS software. *NOTE: the GriPhyN deliverables to CMS have to be better specified, together with Paul Avery and Ian Foster, PIs of GriPhyN.*

Deliverable:	**18.6-a GriPhyN Year 1 Virtual Data Toolkit (VDT-1)**
Description:	The VDT-1 focus is on providing an initial set of enabling grid services.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	December 2001
Risks/Constraints:	*some risks ?*

Deliverable:	**18.6-b GriPhyN Year 2 Virtual Data Toolkit (VDT-2)**
Description:	The VDT-2 focus is on centralized virtual data services. This means that key virtual data grid components like catalogs and schedulers will have centralized, not distributed, implementations.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	December 2002
Risks/Constraints:	*some risks ?*

Deliverable:	**18.6-c GriPhyN Year 3 Virtual Data Toolkit (VDT-3)**
Description:	The VDT-3 focus is on distributed virtual data services, this means that key virtual data grid components like catalogs and schedulers will have distributed implementations.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	December 2003
Risks/Constraints:	*some risks ?*

Deliverable:	**18.6-d GriPhyN Year 4 Virtual Data Toolkit (VDT-4)**
Description:	The VDT-4 focus is on scalable virtual data services, on tools that support grids with the size required by running LHC experiments.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	December 2004
Risks/Constraints:	*some risks ?*

Deliverable:	**18.6-e GriPhyN Year 5 Virtual Data Toolkit (VDT-5)**
Description:	The VDT-5 focus is on enhancing the services of the VDT-4 as a result of experience with large scale applications.
Responsible:	*Responsible person*
Client(s):	CMS CGG and CCS Groups; EUDG Project
End Date:	December 2005
Risks/Constraints:	*some risks ?*

18.7 Computing Model Simulation

Deliver the modelling tools to simulate worldwide simulation, reconstruction, analysis and data movement.

Annexes

A Level 3 Task Breakdown

B List of Deliverables

C Details of Resources

Deliverable	2001	2002	2003	2004	2005	2006	2007
1.1-a T0/T1 Liaison	0.2 (0.2)	0.2 (0.2)					
1.1-a T0/T1 Liaison			0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)	0.4 (0)
1.1-b CMS T0/T1 Configuration	0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)
1.1-b CMS T0/T1 Configuration			0.3 (0)	0.3 (0)	0.3 (0)	0.3 (0)	0.3 (0)
1.1-b CMS T0/T1 Configuration					0.5 (0)	0.5 (0)	0.5 (0)
1.1-c RC Distributed Computing	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)
1.1-d T0 Online connectivity		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.1-d T0 Online connectivity				0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)
1.1-d T0 Online connectivity						0.2 (0)	0.2 (0)
1.1-e User Administration at CERN-T1	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)
1.1-e User Administration at CERN-T1		0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)
1.1-f T0/T1 monitoring and trouble-shooting	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)
1.1-f T0/T1 monitoring and trouble-shooting		0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)
1.4-a WAN resources placeholder	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.4-a WAN resources placeholder			0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)	0.2 (0)
1.5-a Projection of cost and technology of CPU power		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.5-b Projection of cost and technology of disk		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.5-c Projection of cost and technology of mass storage		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.5-d Technology and cost projection of wide-area networks		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
1.6-a Computational Simulation Verification	0.5 (0.5)	0.5 (0.5)					
1.6-b Tier1 Simulations			0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
1.6-c Tier2 Simulations			0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
1.6-d Simulations of Tier0/Tier1/Tier2 Interactions			0.4 (0.4)	0.4 (0.4)	0.4 (0.4)	0.4 (0.4)	0.4 (0.4)
1.7-a Prototype T0/T1 Liaison	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
1.7-b Liaison with Regional Prototype T1 Centres	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)			
1.7-g Liaison with Prototype T2 Centres	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)	0.2 (0.1)			

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Sub-total for Task: 1 Computing Centres	*3.5 (1.5)*	*5 (2)*	*6.2 (2.3)*	*6.4 (2.3)*	*6.5 (2.1)*	*6.7 (2.1)*	*6.7 (2.1)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
2.1-a CMS Computing and Software Development Environment	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)
2.1-a CMS Computing and Software Development Environment				*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
2.1-b Tools for Data preparation for processing	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
2.1-b Tools for Data preparation for processing		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
2.1-c Computing administration and operations	*0.5 (0.4)*	*0.5 (0.4)*	*0.5 (0.4)*	*0.5 (0.4)*	*0.5 (0.4)*	*0.5 (0.4)*	*0.5 (0.4)*
2.2-a Hardware configuration	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
2.2-b System support and administration	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
2.2-b System support and administration			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
2.2-b System support and administration					*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
2.3-a Deployment and Operation of WWW Server	*0.7 (0.4)*	*0.7 (0.4)*	*0.7 (0.4)*	*0.7 (0.4)*	*0.7 (0.4)*	*0.7 (0.4)*	*0.7 (0.4)*
2.3-a Deployment and Operation of WWW Server		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
2.3-a Deployment and Operation of WWW Server					*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
2.3-b Deployment and Maintenance of Collaboration Database System	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)
2.3-c System for Storing Documents (Technical Notes	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)
2.3-d Development and Maintenance of CCS WWW pages	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
2.4-a Distributed Software Support System	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
2.4-b E-mail systems including Lists	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
2.4-c News System	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
2.4-d Calendar System	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
2.4-e Collaborative Working Tools	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
2.4-e Collaborative Working Tools		*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
2.4-e Collaborative Working Tools					*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
2.5-a Problem reporting system	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
2.5-b Maintained action list	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
2.5-c Closed problem	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*

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2.5-d Trend analysis	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
Sub-total for Task: 2 General CMS Computing and Software Services	*4.9 (3.2)*	*6 (3.2)*	*6.3 (3.2)*	*6.8 (3.2)*	*7.9 (3.2)*	*7.9 (3.2)*	*7.9 (3.2)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
3.1-a Tools to Create and Manage Architecture Document Views	0.2 (0.2)						
3.1-a Tools to Create and Manage Architecture Document Views		0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.1-b Top-Level Architectural Description	0.3 (0.3)	0.1 (0.1)					
3.1-b Top-Level Architectural Description		0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.1-c Top-Level Core Framework Description	*0.3 (0.1)*	*0.1 (0)*					
3.1-c Top-Level Core Framework Description		0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.1-d Top-Level Framework Specialisation Descriptions	*0.2 (0)*	*0.2 (0)*					
3.1-d Top-Level Framework Specialisation Descriptions			0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.2-a Framework Design Document	*0.2 (0)*	*0.2 (0)*					
3.2-a Framework Design Document			0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.2-b Framework for use by Reconstruction Software	*0.5 (0.2)*						
3.2-c Common Framework for use in Software for Physics	*0.3 (0.2)*	*0.3 (0.2)*					
3.2-c Common Framework for use in Software for Physics			*0.6 (0.3)*	*0.6 (0.3)*			
3.2-c Common Framework for use in Software for Physics					*0.5 (0.3)*	*0.5 (0.3)*	*0.5 (0.3)*
3.2-d Creation of an Independent Releasable Unit for the Framework							
3.3-a Framework Specialisation for Simulation	*0.2 (0.1)*	*0.3 (0.1)*					
3.3-a Framework Specialisation for Simulation			*0.6 (0.1)*	*0.6 (0.1)*			
3.3-a Framework Specialisation for Simulation					*0.3 (0.1)*	*0.3 (0.1)*	*0.3 (0.1)*
3.3-b Framework Specialisation for Reconstruction	*0.2 (0.1)*	*0.2 (0.1)*					
3.3-b Framework Specialisation for Reconstruction			*0.2 (0)*	*0.6 (0.1)*			
3.3-b Framework Specialisation for Reconstruction		0.1 (0.1)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
3.3-c Framework Specialisation for Production Meta-Data Management	0.2 (0.2)	0.2 (0.2)					
3.3-c Framework Specialisation for Production Meta-Data Management			*0.5 (0.1)*	*0.5 (0.1)*			
3.3-c Framework Specialisation for Production Meta-Data Management					*0.3 (0.1)*	*0.3 (0.1)*	*0.3 (0.1)*
3.3-d Auxiliary Framework for Interactive Analysis	0.2 (0.2)	0.2 (0.2)					

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3.3-d Auxiliary Framework for Interactive Analysis			*0.6 (0.3)*	*0.6 (0.3)*			
3.3-d Auxiliary Framework for Interactive Analysis					0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
3.4-a Integration Maintenance and Upgrades of non-CMS Software used by CMS Physics Software	0.2 (0.2)	0.2 (0.2)	0.1 (0.1)				
3.4-a Integration Maintenance and Upgrades of non-CMS Software used by CMS Physics Software			0.3 (0.3)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)
3.4-b Basic class libraries	0.3 (0.3)	0.3 (0.3)					
3.4-b Basic class libraries			*0.6 (0.3)*	*0.6 (0.3)*	*0.6 (0.3)*	*0.6 (0.3)*	*0.6 (0.3)*
3.4-c Persistent Basic class libraries	0.2 (0.2)	0.2 (0.2)					
3.4-c Persistent Basic class libraries			*0.5 (0.2)*	*0.5 (0.2)*			
3.4-c Persistent Basic class libraries					*0.7 (0.2)*	*0.7 (0.2)*	*0.7 (0.2)*
3.4-d Specific toolkit for G3/CMSIM	0.1 (0.1)	0.1 (0.1)					
3.4-e Specific toolkit for G4	0.2 (0.2)						
3.4-e Specific toolkit for G4		0.5 (0.5)	0.5 (0.5)				
3.4-e Specific toolkit for G4				0.2 (0.2)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
3.4-f Specific toolkit for Data Acquisition Environment		0.1 (0.1)	0.1 (0.1)				
3.4-f Specific toolkit for Data Acquisition Environment				*0.5 (0.1)*	*0.5 (0.1)*	*0.5 (0.1)*	*0.5 (0.1)*
3.4-g Specific toolkit for Grid Environment		*0.5 (0)*	*0.2 (0)*				
3.4-g Specific toolkit for Grid Environment			*0.7 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
3.4-h Specific toolkit for Visualisation	*0.2 (0)*	*0.2 (0)*					
3.4-h Specific toolkit for Visualisation			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
3.5-a Requirement and Constraint Document to the Framework from Grid Infrastructure.	*0.1 (0)*	*0.2 (0)*					
3.5-a Requirement and Constraint Document to the Framework from Grid Infrastructure.			*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
3.5-b Requirement and Constraint Document from the Framework to Grid Services.	*0.1 (0)*	*0.2 (0)*					
3.5-b Requirement and Constraint Document from the Framework to Grid Services.			*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
3.5-c Integration of Framework and Grid Services.		*0.5 (0)*	*0.5 (0)*				
3.5-c Integration of Framework and Grid Services.				*1.5 (0)*	*1.5 (0)*		
3.5-c Integration of Framework and Grid Services.						*1 (0)*	*1 (0)*
3.6-a Document describing the use cases and scenarios for interactive analysis	*0.1 (0)*						

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3.6-a Document describing the use cases and scenarios for interactive analysis		0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)
3.6-b Requirements document derived from on an analysis of the use-cases and scenarios	0.1 (0)						
3.6-b Requirements document derived from on an analysis of the use-cases and scenarios			0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
3.6-c IGUANA Repository using the CMS-standard Configuration Management System	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)				
3.6-c IGUANA Repository using the CMS-standard Configuration Management System				0.3 (0.1)	0.3 (0.1)	0.3 (0.1)	0.3 (0.1)
3.6-d Generic Software for Event Display	0.3 (0.1)						
3.6-d Generic Software for Event Display		0.6 (0.1)	0.6 (0.1)	0.6 (0.1)	0.6 (0.1)	0.6 (0.1)	0.6 (0.1)
3.6-e Detector Description Browsing and Visualisation	0.1 (0)						
3.6-e Detector Description Browsing and Visualisation		0.6 (0)	0.6 (0)				
3.6-e Detector Description Browsing and Visualisation				0.3 (0)	0.3 (0)	0.3 (0)	0.3 (0)
3.6-f Event Collection Browsing and Manipulation Tools	0.2 (0)	0.2 (0)					
3.6-f Event Collection Browsing and Manipulation Tools			0.6 (0)	0.6 (0)	0.6 (0)	0.6 (0)	0.6 (0)
3.6-g Integration of non-CMS Data Analysis and Presentation Tools	0.2 (0.1)	0.2 (0.1)					
3.6-g Integration of non-CMS Data Analysis and Presentation Tools			0.6 (0.1)	0.6 (0.1)			
3.6-g Integration of non-CMS Data Analysis and Presentation Tools					0.8 (0.1)	0.8 (0.1)	0.8 (0.1)
3.6-i GUI Widgets Library		0.2 (0.1)	0.2 (0.1)				
3.6-i GUI Widgets Library				0.4 (0.1)	0.4 (0.1)	0.4 (0.1)	0.4 (0.1)
3.7-a Central Repository of Detector Description Data	0.1 (0)						
3.7-a Central Repository of Detector Description Data		1 (0)	1 (0)				
3.7-a Central Repository of Detector Description Data				0.5 (0)	0.5 (0)	0.5 (0)	0.5 (0)
3.7-b Interfaces to Engineering Descriptions of Data	0.1 (0)						
3.7-b Interfaces to Engineering Descriptions of Data		0.5 (0)	0.5 (0)				
3.7-b Interfaces to Engineering Descriptions of Data				0.3 (0)	0.3 (0)	0.3 (0)	0.3 (0)
3.7-c Interfaces to Simulation	0.2 (0.2)						
3.7-c Interfaces to Simulation		0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)
3.7-d Magnetic Field Description	0.2 (0)	0.3 (0)	0.3 (0)				
3.7-d Magnetic Field Description				0.1 (0)	0.1 (0)	0.1 (0)	0.1 (0)

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3.8-j Technology report	*0.2 (0)*	*0.2 (0)*					
3.8-j Technology report			*1.5 (0)*	*1.5 (0)*			
3.8-j Technology report					*1 (0)*	*1 (0)*	*1 (0)*
Sub-total for Task: 3 Architecture Frameworks and Toolkits	*6.1 (3.1)*	*9.8 (3.4)*	*14.3 (3.9)*	*15.2 (3.8)*	*13.7 (3.8)*	*13.2 (3.8)*	*13.2 (3.8)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
4.1-b Configuration description	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
4.1-e SCRAM development and support	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*
4.1-f CVSpm support	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
4.1-g cvs-server and repository maintenance	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
4.1-h Code Wizard and deployment and support		*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
4.1-i McCabe deployment		*0.2 (0)*					
4.1-i McCabe deployment		*0.1 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
4.1-j Header File Checking Tool		0.1 (0.1)					
4.1-k Development/Deployment of a Software Dependency Analyser		*0.5 (0)*	*0.5 (0)*				
4.1-k Development/Deployment of a Software Dependency Analyser				*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
4.1-l Coding rule and style rule checker							
4.1-m Validation infrastructure	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)	0.5 (0.5)
4.1-n Assessment record			*0.4 (0)*	*0.4 (0)*			
4.1-n Assessment record					*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
4.1-o Process document templates							
4.2-a Preparation of releases and installation at CERN	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
4.2-b Automatic test procedure (using examples) for new releases		*0.1 (0)*	*0.1 (0)*				
4.2-b Automatic test procedure (using examples) for new releases				*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
4.2-c Release distribution and installation tools	*0.1 (0)*	*0.1 (0)*					
4.2-c Release distribution and installation tools			*0.3 (0)*	*0.3 (0)*			
4.2-c Release distribution and installation tools					*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
4.2-d Nightly builds			*0.5 (0)*				
4.2-d Nightly builds				*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
4.3-a Infrastructure to support non-CMS software	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
4.3-b Verification and Integration of non-CMS software	*0.2 (0)*	*0.2 (0)*					

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4.3-b Verification and Integration of non-CMS software			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
4.3-b Verification and Integration of non-CMS software						*0.3 (0)*	*0.3 (0)*
4.4-a Software profiling system		*0.1 (0)*					
4.4-a Software profiling system			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
4.4-a Software profiling system						*0.3 (0)*	*0.3 (0)*
4.4-b Benchmark definition		*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
4.4-c Benchmark report		*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*
4.5-a Help-desk	*0.2 (0)*	*0.2 (0)*					
4.5-a Help-desk			*1 (0)*	*1 (0)*			
4.5-a Help-desk					*1.5 (0)*	*1.5 (0)*	*1.5 (0)*
4.5-b Training	*0.2 (0)*	*0.2 (0)*					
4.5-b Training			*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*	*0.4 (0)*
4.5-c Example Programs	*0.2 (0)*	*0.2 (0)*					
4.5-c Example Programs			*0.6 (0)*	*0.6 (0)*	*0.6 (0)*		
4.5-c Example Programs						*0.3 (0)*	*0.3 (0)*
4.6-a Documentation infrastructure		*0.5 (0)*					
4.6-a Documentation infrastructure			*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
Sub-total for Task: 4 Software Users and Developers Environment	*2.6 (0.7)*	*4.5 (0.8)*	*8 (0.7)*	*7.7 (0.7)*	*8.2 (0.7)*	*7.5 (0.7)*	*7.5 (0.7)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
5.1-a Quality assurance: Strategy	*0.1 (0)*						
5.1-b Quality assurance: standards		0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)
5.1-c Quality assurance: record		*0.5 (0)*					
5.1-c Quality assurance: record			*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
5.1-d Quality assurance: Closed problem report		*0.5 (0)*					
5.1-d Quality assurance: Closed problem report			*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
5.1-k Metrics analysis paper	*0.2 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
5.3-g Integration Testing		*1 (0)*					
5.3-g Integration Testing			*1.5 (0)*	*1.5 (0)*			
5.3-g Integration Testing					*2 (0)*	*2 (0)*	*2 (0)*
Sub-total for Task: 5 Software Process and Quality	*0.3 (0)*	*2.4 (0.1)*	*3.9 (0.1)*	*3.9 (0.1)*	*4.4 (0.1)*	*4.4 (0.1)*	*4.4 (0.1)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
6.1-a Documentation of the production process	*0.2 (0)*						
6.1-a Documentation of the production process	*0.1 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
6.1-b Tools for production job specification	0.4 (0.4)						
6.1-b Tools for production job specification		0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)
6.1-c Tools for production job generation	0.3 (0.3)						
6.1-c Tools for production job generation		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.1-d Tools for high level tracking of production jobs	*0.2 (0)*	*0.2 (0)*					
6.1-d Tools for high level tracking of production jobs		*0.2 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.1-e Tools for low level tracking and control of production jobs	*0.3 (0)*	*0.2 (0)*					
6.1-e Tools for low level tracking and control of production jobs			*0.2 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.1-f Tools for job-level validation of results	*0.2 (0)*	*0.4 (0)*					
6.1-f Tools for job-level validation of results			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.1-g Tools for error discovery and recovery	*0.5 (0)*						
6.1-g Tools for error discovery and recovery		*0.6 (0)*	*0.6 (0)*	*0.6 (0)*	*0.6 (0)*	*0.6 (0)*	*0.6 (0)*
6.1-h Tools for monitoring of production resources	*0.7 (0)*						
6.1-h Tools for monitoring of production resources		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.1-i Tools for automatically reconfiguring farm parameters		*0.3 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
6.1-i Tools for automatically reconfiguring farm parameters						*1 (0)*	*1 (0)*
6.2-a Tools for the definition of samples to be produced through liaison with PRS	*0.3 (0)*	*0.5 (0)*					
6.2-a Tools for the definition of samples to be produced through liaison with PRS			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.2-b Coordination	*0.8 (0)*	*1 (0)*	*1 (0)*	*1 (0)*			
6.2-b Coordination					*1.5 (0)*	*1.5 (0)*	*1.5 (0)*
6.3-a Grid integration		*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
6.4-a Publish catalogs and contents (local and WAN) and check coherence	*0.3 (0)*	*0.5 (0)*					
6.4-a Publish catalogs and contents (local and WAN) and check coherence			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*

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6.4-b Tools for integrating results from distributed productions	*0.3 (0)*	*0.5 (0)*					
6.4-b Tools for integrating results from distributed productions			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.4-c Tools for resource allocation (disk	*0.4 (0)*	*0.6 (0)*	*0.6 (0)*	*0.6 (0)*			
6.4-c Tools for resource allocation (disk					*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
6.4-d Tools for optimising performance		*0.3 (0)*	*0.5 (0)*	*0.2 (0)*			
6.4-d Tools for optimising performance				*0.5 (0)*	*1 (0)*	*1 (0)*	*1 (0)*
6.4-e Tools for facilitating common DB administration tasks	*0.3 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
6.4-e Tools for facilitating common DB administration tasks						*1 (0)*	*1 (0)*
6.4-f Tools for facilitating user-level DB administration tasks		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*			
6.4-f Tools for facilitating user-level DB administration tasks					*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
6.4-g Tools for making DB sanity checks			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
6.4-g Tools for making DB sanity checks						*1 (0)*	*1 (0)*
Sub-total for Task: 6 Production Processing and Data Management	*5.3 (0.7)*	*8.2 (0.3)*	*8.3 (0.3)*	*8.6 (0.3)*	*9.3 (0.3)*	*10.8 (0.3)*	*10.8 (0.3)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
7.0-h Online Filter Software Management	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.1 (0.1)		
7.0-h Online Filter Software Management					0.3 (0.3)	0.5 (0.5)	0.5 (0.5)
7.0-h Online Filter Software Management					*1.2 (0)*	*2 (0)*	*2 (0)*
7.1-a Data access interface and EFF-DAQ interconnect	*0.5 (0.2)*	*0.5 (0.2)*	*0.5 (0.2)*	*0.5 (0.2)*			
7.1-b Raw data formats	*0.1 (0)*	*0.1 (0)*	*0.1 (0)*				
7.1-b Raw data formats						*0.3 (0)*	*0.3 (0)*
7.1-c Data Playback		*0.3 (0)*	*0.3 (0)*				
7.1-c Data Playback						*0.2 (0)*	*0.2 (0)*
7.2-a Local data storage				*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
7.2-b Interface to CS and DB				*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	
7.2-c “Express-line” Interface				*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	
7.3-a Configuration and setup	*0.3 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
7.3-b Interface to Farm Control system		*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*		
7.3-c Online Reconstruction control	*0.3 (0)*	*0.5 (0)*	*0.5 (0)*	*0.2 (0)*			
7.3-d Detector/Trigger/Physics monitor				*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	
7.4-a Code guidelines and specs	0.1 (0.1)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)		
7.4-a Code guidelines and specs						*0.5 (0.2)*	*0.5 (0.2)*
7.4-b Performance benchmarks		*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	
7.4-c Quality assurance and validation		*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	*0.2 (0)*	
7.5-a RC&C handling		0.1 (0.1)	0.1 (0.1)	0.1 (0.1)	0.1 (0.1)		
7.5-b Run Conditions toolkit/API				*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	
7.5-c Calibrations toolkit/API				*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	
Sub-total for Task: 7 Online Filter Software Framework	*1.5 (0.5)*	*3.3 (0.7)*	*3.3 (0.7)*	*4.7 (0.7)*	*5.4 (0.7)*	*6 (0.7)*	*3.7 (0.7)*

Deliverable	2001	2002	2003	2004	2005	2006	2007
8.2-a Hardware installation/management. Early on will take care of scaled down prototype setups.			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
8.2-b Operating System maintenance			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*
8.2-c Hardware database			*0.2 (0)*	*0.2 (0)*	*0.2 (0)*		
8.2-c Hardware database						*0.5 (0)*	*0.5 (0)*
8.2-d T0 Online connectivity					*0.2 (0)*	*0.2 (0)*	*0.2 (0)*
8.2-e Load Sharing/Job Control			*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
8.3-a Code Versioning/Distribution		*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
8.3-b System startup/sw installation					*0.3 (0)*	*0.3 (0)*	*0.3 (0)*
8.4-a Status Monitoring/Fault Detection			*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	
8.4-b Runtime monitoring				*0.5 (0)*	*0.5 (0)*	*0.5 (0)*	
Sub-total for Task: 8 Online Farm(s)		*0.3 (0)*	*2.3 (0)*	*2.8 (0)*	*3.3 (0)*	*3.6 (0)*	*2.6 (0)*

CPT TOTAL	*24.2 (9.7)*	*39.5 (10.5)*	*52.6 (11.2)*	*56.1 (11.1)*	*58.7 (10.9)*	*60.1 (10.9)*	*56.8 (10.9)*